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PALEONTOLOGY.—*Generic descriptions of Upper Paleozoic Bryozoa.*[1] R. S. BASSLER, U. S. National Museum.

This is the first of several short contributions in which the writer proposes to describe and illustrate the genotypes of some new or imperfectly known genera of fossil Bryozoa. In the author's *Index and bibliography of genera and genotypes of Bryozoa*, comprising Part 67 of the *Fossilium catalogus* published by W. Junk at The Hague, 1934, the systematic position of the described genera was suggested. Since then special efforts have been made to study either the types or typical specimens, with the result that in many cases illustrations of their internal structure can now be offered.

The death of Dr. George H. Girty in 1939 precluded further work on the many invertebrates he had described without illustration in his article *New genera and species of Carboniferous fossils from the Fayetteville shale of Arkansas*,[2] wherein descriptions only of eight new bryozoan genera of Trepostomata and Cryptostomata from this Mississippian formation were given. Short diagnoses of these genera and notes upon *Stenopora* Lonsdale and *Nemataxis* Hall, genera of earlier date, with illustrations of their internal structure, form the subject of the present paper. The type specimens of Dr. Girty's Fayetteville shale Bryozoa are missing, but the thin sections of the genotypes studied by him are still available. Thus further work on the various species is still necessary, but the sections will serve for the illustration of the generic characteristics. Furthermore, Dr. Girty's descriptions are so very detailed that for present purposes short diagnoses emphasizing the essential generic characteristics in addition to the illustrations are sufficient.

Order TREPOSTOMATA (family BATOSTOMELLIDAE Ulrich, 1890)

Genus **Stenopora** Lonsdale, 1844[3]

The recent discovery of a well-preserved example of the genotype in the national collections has permitted the illustration of the true internal char-

[1] Published by permission of the Secretary of the Smithsonian Institution. Received February 20, 1941.
[2] Ann. New York Acad. Sci. 20(no. 3, pt. 2): 189–238. Oct. 1910 (1911).
[3] Lonsdale in Darwin's *Volcanic islands*, appendix, p. 161. 1844.

acters of this genus, namely, the presence of strongly beaded zooecial walls and of a large and a small set of acanthopores, the lack of mesopores, and the practical absence of diaphragms of any nature. Formerly *Stenopora* was held for species with perforated diaphragms. Then with Lee's work in 1912,[4] the genus was restricted to ramose forms with complete diaphragms, and *Tabulipora* Young, 1883, was recognized for the species with perforated ones. In 1929, the present author, misled by the original illustrations and descriptions of *Stenopora* and by the prevailing opinion of authors, proposed the genus *Ulrichotrypa* for ramose species in which diaphragms were absent. Now, as shown here in figs. 5, 6, the internal structure of *S. tasmaniensis* is the same as that described for *Ulrichotrypa*, thus reducing the latter to synonymy.

Genotype: *S. tasmaniensis* Lonsdale, 1844. Permian of Tasmania. (Figs. 5, 6.)

Genus **Amphiporella** Girty, 1911 (*op. cit.*, p. 199)

Zoarium of large tortuous solid flat fronds in which the zooecia proceed in opposite directions from a middle plain but not from a median plate as in typical bifoliate species. Zooecial structure with strongly moniliform (beaded) walls as in typical *Stenopora* but differing in the occurrence of perforated diaphragms and numerous mesopores. In tangential sections acanthopores of medium size are seen at the junction of the walls and a connecting row of granules occurs along the line of zooecial contact. The frondose growth and mesopores alone distinguish *Amphiporella* from *Tabulipora*, features perhaps of no generic importance.

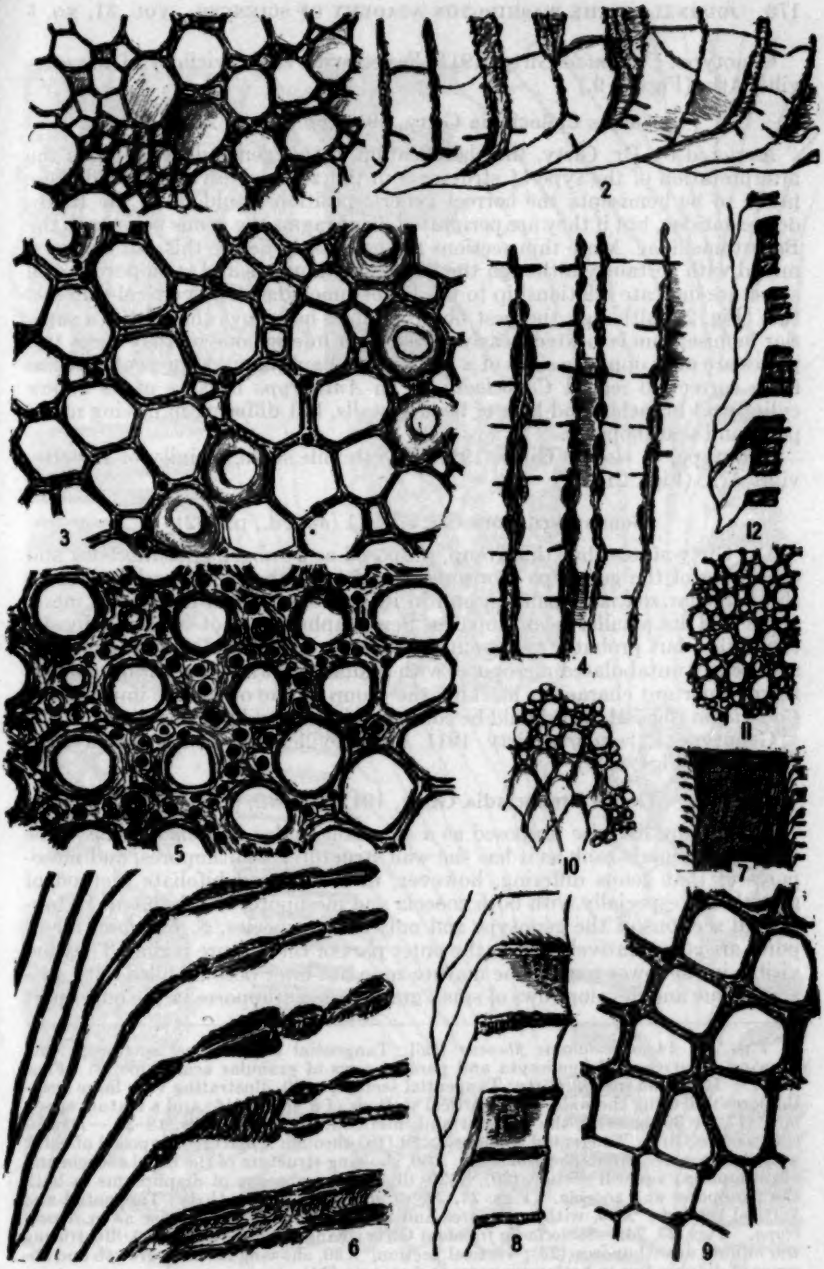
Genotype: *A. maculosa* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 3, 4.)

Genus **Coeloclemis** Girty, 1911 (*op. cit.*, p. 201)

Described as a new subgenus under probably *Anisotrypa* although the genus is not mentioned, thin sections of the genotype, *C. tumida*, indicate a zoarium of hollow epithecated stems formed by a single layer of zooecia, with internal zooecial structure similar to *Anisotrypa* except that well-developed acanthopores occur and diaphragms of all kinds are absent. Vertical sections show a very short immature region with the tubes bending abruptly outward into an equally short mature zone, a structure so similar to certain Cryptostomata that it is possible that future discoveries may show that the genus is incorrectly placed in the Batostomellidae. At present, however, *Coeloclemis* is considered the same as *Anisotrypa* save that clearly outlined acanthopores occur usually at the zooecial junctions and the walls in tangential sections show a single or double row of small granules.

[4] LEE, G. W., Mem. Geol. Surv. Great Britain, Paleontology, 1(pt. 3): 135–195, pls. 14–16. 1912.

Figs. 1, 2.—*Pycnopora regularis* Girty: Tangential and vertical sections, ×30, illustrating the untabulated mesopores and perforated diaphragms. Figs. 3, 4.—*Amphiporella maculosa* Girty: Tangential and vertical sections, ×30, showing acanthopores, beaded walls, perforated diaphragms, and numerous mesopores. Figs. 5, 6.—*Stenopora tasmaniensis* Lonsdale: Tangential and vertical sections, ×30, showing beaded walls, absence of diaphragms, and occurrence of two sets of acanthopores are shown. Figs. 7–9.—*Coeloclemis tumida* Girty: Vertical section, ×4½, and part of the same ×30 (7, 8), and tangential section, ×30 (9) exhibiting characters as in *Anisotrypa* save that acanthopores are developed and diaphragms are wanting. Figs. 10–12.—*Syringoclemis biserialis* Girty. Tangential sections (10, 11) the first near the base of mature region illustrating cryptostomatous shape of mature zooecium, and the second in the most mature portion, ×20, with vertical section, ×20 (12) showing absence of hemisepta and diaphragms.



Figs. 1–12.—(See opposite page for explanation.)

Genotype: *C. tumida* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 7–9.)

Genus **Callocladia** Girty, 1911 (*op. cit.*, p. 212)

As noted by Dr. Girty, the classification of this genus depends upon the interpretation of the type of structures in the zooecial cavity. Should these prove to be hemisepta the correct generic position would be in the Rhabdomesontidae, but if they are perforated diaphragms the genus belongs to the Batostomellidae. More thin sections are necesssary before this can be determined with certainty although the large acanthopores and stenoporoid wall structure indicate relationship to the Batostomellidae. The vertical thin section (Fig. 22) although the best observed does not prove that either a superior hemiseptum is located nearly opposite an inferior one or that these two plates are only opposite sides of a perforated diaphragm. At present it seems more correct to regard *Callocladia* as an *Anisotrypa* because of its hollow cylindrical branches and lack of beaded walls, but differing in having mesopores and acanthopores.

Genotype: *C. elegans* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 21, 22.)

Genus **Pycnopora** Girty, 1911 (*op. cit.*, p. 202)

Dr. Girty states that this group, proposed as a subgenus of *Lioclema* and consisting of the genotype *P. regularis* and two other species, differs in its thin lamellar zoarial expansion and in its greatly reduced number of mesopores and its smaller acanthopores. Semidiaphragms not always opposite each other but probably representing centrally perforated diaphragms, and apparently untabulated mesopores with undulating walls, are additional and more important characters marking the group as one of generic importance. *Callocladia* (figs. 21, 22) should be compared in the study of this genus.

Genotype: *P. regularis* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 1, 2.)

Genus **Stenocladia** Girty, 1911 (*op. cit.*, p. 204)

This group, likewise proposed as a subgenus under *Lioclema*, seems to be worthy of generic rank as it has the wall structure, acanthopores, and mesopores of that genus differing, however, in a supposed bifoliate method of growth and especially with both zooecia and mesopores untabulated. In tangential sections of the genotype and only known species, *S. frondosa*, mesopores are comparatively few in the outer part of the mature region. They are visible in the lower part of the mature zone but later become filled with striated tissue and develop rows of small granular acanthopores in the outer part

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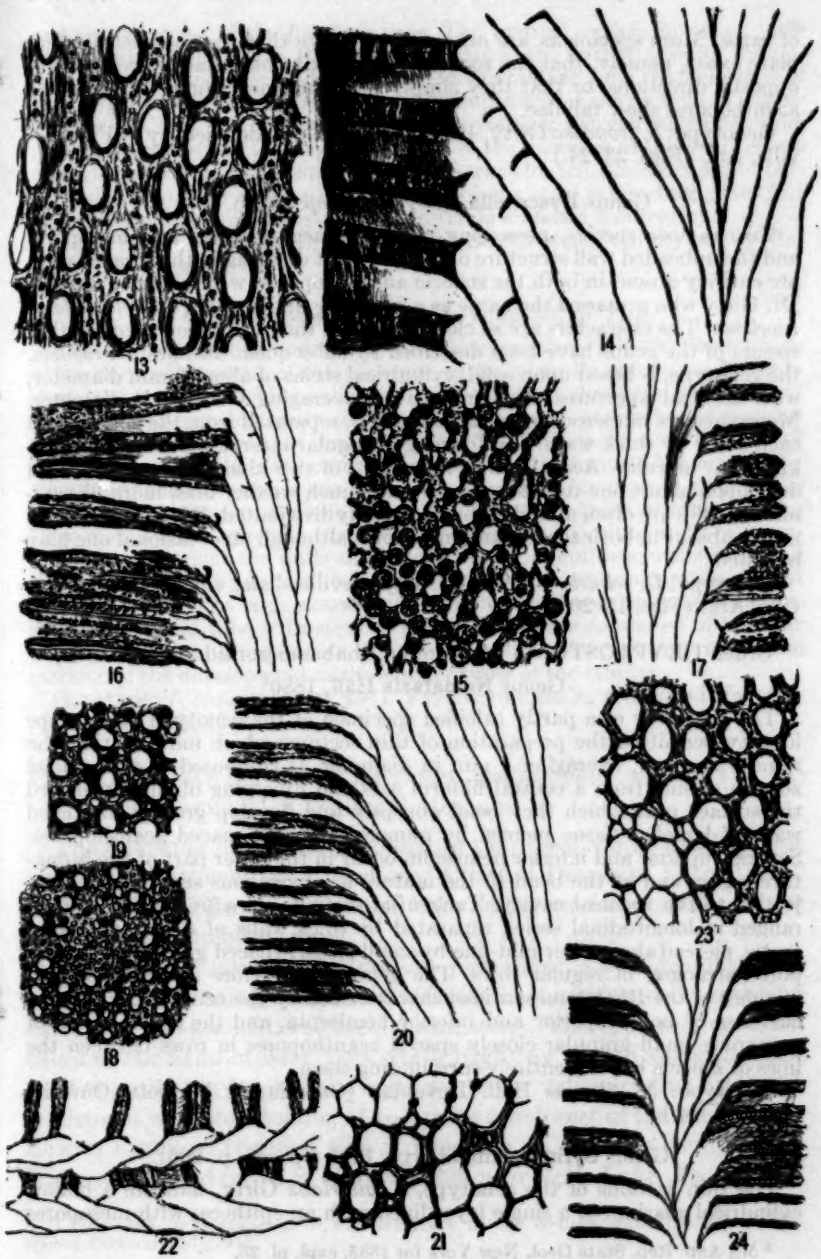
Figs. 13, 14.—*Nemataxis fibrosus* Hall: Tangential and vertical sections, ×30, showing occurrence of hemisepta and parallel rows of granular acanthopores. Figs. 15–17.—*Idioclema insigne* Girty: Tangential section, ×30, illustrating very large acanthopores indenting the walls (15); vertical sections of a young (16) and a mature specimen (17), ×30, showing the superior and inferior hemisepta. Figs. 18–20.—*Dyscritella robusta* Girty: Tangential sections, ×20 (18) through a macula composed of thick walled mesopores; similar section (19), ×30, showing structure of the usual zooecia and acanthopores; vertical section (20), ×20, illustrating absence of diaphragms in both the mesopores and zooecia. Figs. 21, 22.—*Callocladia elegans* Girty: Tangential and vertical sections, ×20, with mesopores and acanthopores but otherwise as in *Anisotrypa*. Figs. 23, 24.—*Stenocladia frondosa* Girty: Tangential section, ×30, illustrating the minute acanthopores (23); vertical section, ×30, showing bifoliate growth and absence of diaphragms in both mesopores and zooecia (24).



Figs. 13–24.—(See opposite page for explanation.)

of same. More specimens are necessary to prove that the so-called median plate exists, namely, that the zooecia arise back to back and proceed out in opposite directions, or that they simply form flattened fronds. Some of the acanthopores show tabulae.

Genotype: *S. frondosa* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 23, 24.)

Genus **Dyscritella** Girty, 1911 (*op. cit.*, p. 193)

Two ramose species, possessing numerous acanthopores and mesopores and the unbeaded wall structure of *Lioclema* but differing in that diaphragms are entirely absent in both the zooecia and mesopores, were assigned here by Dr. Girty who proposed the name as a subgenus under either *Batostomella* or *Lioclema*. The characters are so clearly marked that since then several other species of the genus have been described by subsequent authors. *D. robusta*, the genotype, is based upon solid, cylindrical stems of about 8 mm diameter, with zooecial apertures circular to oval, averaging 0.1 mm in diameter. Mesopores are numerous, circular to angular, separated from the zooecia and each other by thick walls, and forming at regular intervals the aggregations known as maculae. Acanthopores abundant, of two kinds, one set large and developed about one to a zooecium, while much smaller ones more like minute tubules are often abundant but unequally distributed. Diaphragms practically absent in both zooecia and mesopores although an occasional one may be noted.

Genotype: *D. robusta* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 18–20.)

Order CRYPTOSTOMATA (family Rhabdomesontidae Vine, 1883)

Genus **Nemataxis** Hall, 1886[5]

The discovery of a partly calcified specimen of the genotype at the type locality permitted the preparation of thin sections which indicate that the ramose zoarium, averaging 4 mm in diameter, is composed of thin-walled zooecia arising from a central filiform axis and diverging obliquely toward the surface near which they bend abruptly and develop greatly thickened walls of lamellar tissue pierced by numerous closely spaced acanthopores. Several superior and inferior hemisepta occur in the outer part of the immature region and at the bend to the mature a conspicuous superior one projects into the zooecial cavity. Tangential sections show oval apertures arranged in longitudinal series, separated by thick walls of dense laminated tissue, pierced along their mid-line by small closely spaced granular acanthopores arranged in regular rows. The genus is therefore a well-developed member of the Rhabdomesontidae characterized by the central axis, the occurrence of both superior and inferior hemisepta, and the development of numerous small granular closely spaced acanthopores in rows between the lines of zooecia but not entirely surrounding them.

Genotype: *N. fibrosus* Hall. Devonian (Onondaga): Walpole, Ontario. (Figs. 13, 14.)

Genus **Syringoclemis** Girty, 1911 (*op. cit.*, p. 206)

The thin sections of the genotype, *S. biserialis* Girty, indicate a hollow cylindrical zoarium of a single layer lined with an epitheca, with mesopores

[5] 5th Ann. Rep. State Geol. New York for 1885, expl. pl. 25.

and acanthopores of the *Lioclema* type. The vertical section, however, indicates relationships to the Rhabdomesontidae in the boxlike form of the immature region and the sudden bending to the mature zone characteristic of the Cryptostomata. Diaphragms and hemisepta are entirely absent. Tangential sections (Fig. 10) also indicate that the younger zooecial stages have the form characteristic of the Cryptostomata, so the reference to this order seems correct. *Callocladia* has a similar internal structure but possesses either perforated diaphragms or hemisepta. *Syringoclemis* is an interesting genus but more information from the study of additional material is necessary.

Genotype: *S. biserialis* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 10–12.)

Genus **Idioclema** Girty, 1911 (*op. cit.*, p. 210)

This genus described in detail by Dr. Girty requires only the illustrations of the internal structure of the genotype to complete its definition. The zoarium is of freely branching cylindrical stems of 3 mm diameter, composed of zooecia possessing the family characteristics, namely, occurrence of superior and inferior hemisepta, of large and small acanthopores and absence of diaphragms. The superior hemiseptum occurs at the bend to the mature region and the inferior one below this in the thin-walled immature region. The acanthopores represent the two extremes of growth in these structures as the large ones increase often to the size of an ordinary zooecium and are so numerous as to indent the walls and hide the zooecial outlines, while the small set is represented by minute tubular-like structures perforating the general lamellar tissue. The large acanthopores of the usual cone-in-cone structure show the central tube with especial clearness and are composed of lamellar tissue pierced by dark granular tubules. Altogether the genus represents the extreme of the development in the simpler types of the family.

Genotype: *I. insigne* Girty, 1911. Fayetteville shale, vicinity of Fayetteville, Ark. (Figs. 15–17.)

PALEONTOLOGY.—*New Devonian stratigraphic units.*[1] G. ARTHUR COOPER, U. S. National Museum.

The following names are proposed so that they will be available for use on the forthcoming "Correlation Chart of Devonian Formations" of the National Research Council. Two names are new, but the others replace preoccupied terms.

Stony Hollow member of Marcellus formation: A conspicuous layer of sandstone ranging from 75 to 100 feet in thickness and consisting chiefly of fine-grained, calcareous sandstone. The type section is located at the bend of New York State Highway 28 and along the railroad opposite the bend at the entrance to the valley leading up to the settlement of Stony Hollow, 1¾ to 2 miles northwest of the bridge over Esopus Creek on the west side of Kingston, N. Y. This member was first encountered on U. S. Highway 209 near Echo Lake, Pa., and on

[1] Published by permission of the Secretary of the Smithsonian Institution. Received February 21, 1941.

the same road about 1 mile north of Port Jervis, N. Y. It is to be seen at few places between Port Jervis and Kripplebush, but northeast of that place it forms conspicuous cliffs and ledges on the west side of Esopus Creek to Kingston. Northeast of Kingston it appears as cliffs and ledges from Mount Marion to Leeds and from there to Climax on the Coxsacki Quadrangle. It appears also in Coeymans Hollow and was traced to the falls of Onesquethaw Creek southwest of Albany. Here a few layers of limestone appear in the upper part of the sandstone, which has thinned to 24 feet. West of the Onesquethaw these limestones of the Stony Hollow become the Cherry Valley limestone as exposed in Stony Creek, Schoharie Valley.

Although none of the large Cherry Valley cephalopods has been seen in the Stony Hollow member, other fossils were taken that occur in both the sandstone and the limestone. A species of the trilobite *Dechenella* and a small new species of *Pentamerella* are most abundant in both facies. Besides these a number of other new species occur, among them specimens of the brachiopod *Kayserella*. Absence of the characteristic goniatites is explained by the facies change from black limestone to sandstone. In the Middle and Upper Devonian of New York occurrence of goniatites appears to be controlled by facies, the shells of these animals seldom occurring outside of the black and gray shales.

Identification of the Stony Hollow member as the sandstone equivalent of the Cherry Valley limestone helps to elucidate the section along the Catskill Front. Beds hitherto classified as "Marcellus" shale (Bakoven of Chadwick) immediately underlie the Stony Hollow member and are now proved to be the equivalent of the Union Springs member. The Stony Hollow underlies the Mount Marion formation of Grabau at its type section; consequently the Mount Marion is interpreted as the sandy facies of the Chittenango black shale member overlying the Cherry Valley to the west.

Delphi Station member: Proposed to replace the Delphi shale of Cooper, 1930 (not Brown, 1883, or Gould, 1902). The name is derived from Delphi Station, Cazenovia Quadrangle, N. Y., which is about 1½ miles northwest of Knights Falls, the type section of the member.

Chenango sandstone: To replace the Colgate sandstone of Cooper, 1930 (not Calvert, 1912). The name is derived from the Chenango Valley and the type section is the quarry at the top of the hill just south of the buildings on Colgate University campus and overlooking Chenango Valley to the northwest.

Butternut shale: To replace Berwyn of Cooper, 1930 (not Richards

and Birk, 1925) with the type section in the Cascades formed by a branch of Butternut Creek, southeast of Syracuse, Tully Quadrangle, N. Y.

Little Rock Creek limestone: Proposed for the gray, brittle, conchoidally fracturing limestone above the Logansport limestone on Little Rock Creek above the road-crossing a mile above Lockport, Ind. This formation, 7 feet thick, contains a fauna including a large *Chonetes* called *C. manitobensis, Emanuella subumbona,* and a few other species. The lithology and fauna suggest possible relationship to the Tully limestone of New York.

Plum Brook shale: Proposed to replace Plum Creek shale of Grabau, 1917 (not Foerste, 1905, or Ulrich, 1917). Grabau derived his name from Plum Brook, 2 miles northeast of Prout Station, Sandusky Quadrangle, Ohio, but erroneously recorded the name as Plum Creek. The more accurate designation is therefore substituted.

ZOOLOGY.—*A new* Solenocera *and notes on the other Atlantic American species.*[1] MILTON J. LINDNER and WILLIAM W. ANDERSON, U. S. Fish and Wildlife Service. (Communicated by WALDO L. SCHMITT.)

During the course of the investigation of the shrimp fishery of the Gulf of Mexico undertaken with the Fish and Wildlife Service ship *Pelican* several species of the genus *Solenocera* were captured including the new species that is herein described. The *Pelican* type and paratype have been deposited with the U. S. National Museum. A key to the Atlantic American members of this genus has been prepared in order to provide a means for ready identification of the various species and to set forth the relationship of the new species with the other American forms.

We take considerable pleasure in naming this new species for Dr. Frank W. Weymouth, professor of physiology, Stanford University, California, in recognition of the invaluable counsel, training, and advice that we have received from him. We wish to acknowledge our indebtedness also to Dr. Waldo L. Schmitt, of the U. S. National Museum, for his kindness in furnishing us with material and for his ready and continued assistance in all matters.

Solenocera weymouthi, n. sp. Fig. 1, a–e

Material examined.—1 ♀, type; *Pelican* station 137-2; 29°28′ N., 87°30′ W.; March 1, 1939, trawl 46 fathoms.

[1] Published by permission of the Director, Fish and Wildlife Service. Received February 11, 1941.

1 ♂, paratype; *Pelican* station 137-2; 29°28′ N., 87°30′ W.; March 1, 1939, trawl 46 fathoms.

1 ♂, allotype; U.S.N.M. no. 119885; Tortugas, August 5, 1932, 190–280 fathoms; boat station 74.

71 ♂ and 78 ♀ paratypes; *Albatross* station 2605; between Cape Hatteras and Cape Lookout, N. C.; 32 fathoms; U. S. National Museum.

Description.—Antennular flagella flattened and canaliculate but not so pronouncedly so as in the other six American species. Pterygostomian spine absent. Pterygostomian angle produced forward into a blunt flaplike projection. Branchiostegal spine absent. Rostrum rather deep with a convex lower margin, which curves upward to a sharp tip; with a distinct lateral ridge and armed above with 7 to 10, usually 8 or 9, teeth of which three lie behind and one above the orbital margin. Postrostral carina does not extend behind level of cervical sulcus. Cervical sulcus deep and well marked, the posterior margin a sharp ridge. Cervical sulcus does not cross dorsum of carapace. Orbital angle bears a distinct sharp-pointed tooth or spine. Antennal angle produced into a sharp-pointed buttressed spine, which is but little larger than the spine in the orbital angle. Postorbital spine large; larger than hepatic, antennal or orbital angle spines and placed about midway between antennal and orbital angle spines.

Ocular peduncle short and stout, eye large. Antennular flagella very short, about seven-tenths carapace length in type female, but in the Tortugas male the antennular flagella is about one-fifth longer than carapace. Inferior flagellum about twice as broad as superior. Antennular peduncle in type female rather densely coated with pubescence but in smaller specimens this condition is less marked. Antennal scale short in most cases, however, in the type female it exceeds the antennular peduncle by about 7.8 per cent of its own length. In many of the smaller specimens available the antennular peduncle exceeds the antennal scale. When an average was taken of the 130 specimens on which measurements were possible, the antennal scale was found to exceed the antennular peduncle by 1.1 per cent of its own length (length of antennal scale); ranging from −4.6 per cent to +8.5 per cent.

In the type female the third maxilliped extends beyond the antennal scale by about the length of its dactyl. Carpus of third periopods slender for their distal half, but on proximal half the leg rapidly thickens and attains approximately the same thickness as the merus. Ischium and basis of first periopods armed on their distal margins with a large sharp spine. Only basis of second periopods armed. Third, fourth, and fifth periopods with basis and ischium unarmed.

In the type female the coxae of the third, fourth, and fifth periopods are produced medially; those of the third almost uniting, those of the fourth produced less than the third and not nearly meeting, and those of the fifth produced even less than the fourth and widely separated. Median projections of coxae of fourth periopods bear a strong sharp tooth or spine on their proximal margins. These spines project mediad over the plate of the thirteenth sternite. Coxae of the fifth periopods bear a small toothlike projection on their anterior margins.

In the Tortugas male the coxae of the third periopods do not appear to be produced medially, those of the fourth produced only slightly, and those of the fifth more than the fourth but none so extensively as in the female. Anterior margins of coxae of fifth legs bear a large toothlike projection.

Although not well adapted for the open type petasma as encountered in this group we are using Burkenroad's (1936, pp. 61–62) terminology for

designating the various petasmal lobes. We do this rather than substitute additional terminology in order not to make the literature more ambiguous than it is at present. Distoventral lobe of mature male subrectangular in shape and equal to or slightly exceeding the cincinnulated median margin of the endopod. Distolateral lobe consists of three distinct lobules the proximal of which can be referred to Burkenroad's lateral lobule of the distolateral lobe. The two distalmost ones appear to be derived from what Burkenroad (1939) terms the median lobule in *Solenocera atlantidis*; the proximal of these we shall designate as the median lobule and the distal most as the distal

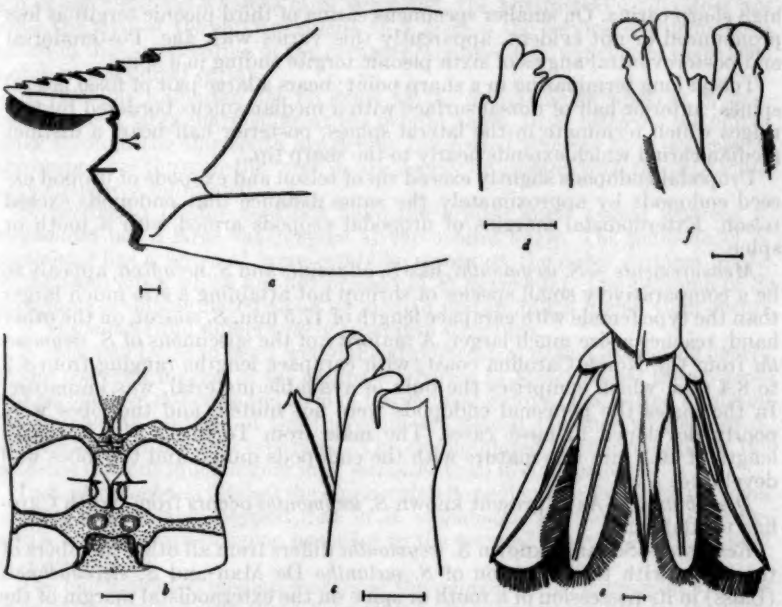


Fig. 1.—*Solenocera weymouthi*, n. sp.: *a*, Carapace, anterior part, lateral view (type female); *b*, thelycum, ventral view (type female); *c*, petasma, posterior view of distal part (left endopod) (allotype); *d*, petasma, immature, posterior view of distal part (left endopod); *e*, telson and uropods, dorsal view (type female). *f*, *Solenocera necopina* Burkenroad: Petasma, posterior view of distal portion. Scale = 1 mm.

lobule. In the mature male the lateral lobule of the distolateral lobe is semi-hook shape and curves over approximately the median half of the distoventral lobe. Median lobule of the distolateral lobe bulbous or knob like and superior to both the lateral lobule and the distoventral lobe. Distal lobule of the distolateral lobe is superior to the other petasmal structures and folds as a semi-membranous hood over the median lobule in much the fashion of a sunbonnet.

Paired teeth on anterior part of fourteenth sternite of female, which in all other species of *Solenocera* from both the Pacific and Atlantic coasts of North America are very prominent, are in *S. weymouthi* very much reduced in size and appear as a pair of well separated short blunt protuberances. Bilobed

ridge evident near the center of the fourteenth sternite slightly forward of median projections of coxae of fifth periopods. Plate of thirteenth sternite with a deep well marked longitudinal sulcus down the center. A pair of large blunt projections arise from posterior part of twelfth sternite and project over anterior portion of thirteenth. Entire thelycum pubescent.

Epipodites through the twelfth deeply bifurcated, shorter ramus one-half or more the length of longer ramus. Epipodites of thirteenth somite shallowly bifurcated.

In the type female the first and second pleonic terga are uncarinated; posterior two-thirds of the third carinated, the fourth, fifth, and sixth with a high sharp carina. On smaller specimens carina of third pleonic tergite is less pronounced or not evident, apparently this varies with age. Posterodorsal and posteroventral angles of sixth pleonic tergite ending in a spine.

Telson long terminating in a sharp point; bears a large pair of fixed lateral spines; anterior half of dorsal surface with a median sulcus bordered by two ridges which terminate in the lateral spines; posterior half bears a distinct median carina which extends nearly to the sharp tip.

Uropodal endopods slightly exceed tip of telson and exopods of uropod exceed endopods by approximately the same distance that endopods exceed telson. Externodistal margins of uropodal exopods armed with a tooth or spine.

Measurements.—*S. weymouthi*, like *S. atlantidis* and *S. necopina*, appears to be a comparatively small species of shrimp not attaining a size much larger than the type female with carapace length of 17.5 mm. *S. vioscai*, on the other hand, reaches a size much larger. A majority of the specimens of *S. weymouthi* from the North Carolina coast, with carapace lengths ranging from 4.2 to 8.4 mm, which comprises the bulk of available material, was immature. In the males the petasmal endopods were not united, and the lobes were poorly developed in most cases. The male from Tortugas with carapace length of 10.3 mm was mature with the endopods united and the lobes well developed.

Distribution.—As at present known *S. weymouthi* occurs from North Carolina to Alabama.

Remarks.—So far as known *S. weymouthi* differs from all other members of the genus with the exception of *S. melantho* De Man and *S. steindachneri* (Balss) in its possession of a tooth or spine on the externodistal margin of the exopod of the uropod (Burkenroad, 1936, pp. 105, 121).

S. weymouthi is further distinct from *S. agassizii* Faxon, *S. membranacea* (Risso), *S. m. africanus* Stebbing, *S. comatus* Stebbing, *S. novae-zealandi* Borradaile, *S. vioscai* Burkenroad, *S. atlantidis* Burkenroad, *S. necopina* Burkenroad, *S. florea* Burkenroad, *S. mutator* Burkenroad, *S. faxoni* De Man, *S. distincta* De Haan, *S.* (*Parasolenocera*) *annectans* Wood-Mason, and possibly *S. crassicornis* H. Milne-Edwards (1837) in that it possesses neither a pterygostomian nor a branchiostegal spine. *S. weymouthi* further differs from *S. crassicornis* in its possession of a pair of fixed lateral spines on the telson; these spines are reported as absent in *S. crassicornis* (Burkenroad, 1934, p. 72).

From those members of the genus that like *S. weymouthi* possess neither pterygostomian nor branchiostegal spines, *S. weymouthi* in addition to the possession of a spine on the externodistal margin of the exopod of the uropod (except *S. melantho* and *S. steindachneri*) differs as follows:

In *S. hextii* Wood-Mason the postrostral carina extends to the posterior

margin of the carapace whereas in *S. weymouthi* the postrostral carina does not continue beyond the level of the cervical sulcus. In the males of *S. hextii* the cincinnulated median margin of the petasma extends beyond the distoventral lobe whereas in *S. weymouthi* the cincinnulated median margin of the petasma falls at about the level of the distoventral lobe. In *S. hextii* the pair of knobs on the fourteenth sternite of the female are placed together whereas in *S. weymouthi* they are well separated. *S. hextii* has a spine on the cervical carina dorsad the hepatic spine which is not present in *S. weymouthi*.

In *S. koelbeli* De Man the postrostral carina extends to the posterior margin of the carapace whereas in *S. weymouthi* the postrostral carina does not cross the level of the cervical sulcus. In *S. koelbeli* the cervical sulcus makes a notch in the dorsal carina of the carapace whereas in *S. weymouthi* there is no notch in the dorsal carina.

S. rathbuni Ramadan has no spine at the orbital angle whereas *S. weymouthi* has a large sharp spine at the orbital angle. In *S. rathbuni* the epipodites through the thirteenth are deeply bifurcated whereas in *S. weymouthi* the epipodites through the twelfth are deeply bifurcated with the thirteenth only shallowly bifurcated.

S. pectinatus (Bate) does not have the orbital angle armed whereas *S. weymouthi* has a large sharp spine at the orbital angle. The petasma of *S. pectinatus* has a series of large comblike spines on the outer surfaces of the distolateral lobes which are not present in *S. weymouthi*. The petasma of *S. pectinatus* is cincinnulated along its median margin much higher than occurs in *S. weymouthi* and differs widely from it in structure.

S. melantho De Man has a well-defined postrostral carina extending nearly to the posterior margin of the carapace whereas in *S. weymouthi* the postrostral carina does not cross the level of the cervical groove. The paired knobs on the fourteenth sternite of the thelycum are placed together whereas in *S. weymouthi* they are well separated. The cincinnulated median margin of the petasma extends much higher in *S. melantho* than in *S. weymouthi*.

In *S. steindachneri* (Balss) the cincinnulated median margin of the petasma extends considerably beyond that in *S. weymouthi*. Furthermore Balss figures a dorsal carapacic spine posterior to the cervical groove. This is lacking in *S. weymouthi*.

The cincinnulated median margin of the petasma of *S. weymouthi* appears to resemble more closely those *Solenocera* possessing branchiostegal or pterygostomian spines than those lacking these spines.

S. weymouthi like other species of the genus from the Atlantic coast of the United States is variable in the matter of the antennal scale exceeding the antennular peduncle, varying from the antennular peduncle exceeding the antennal scale to the scale exceeding the peduncle by 8.5 per cent of its own length. In *S. atlantidis* measurements on 17 specimens from the United States National Museum show that the antennal scale varies from shorter than the antennular peduncle to exceeding it by about 7 per cent of its own length with an average of 1.3 per cent longer. *S. vioscai* agrees very closely in this character (Burkenroad, 1939, p. 15) with *S. weymouthi* and *S. atlantidis*. *S. necopina*, on the other hand, has a longer antennal scale than the other three Atlantic American species. Measurements on 18 specimens of *S. necopina* from the United States National Museum reveal that the antennal scale exceeds the antennular peduncle from over 13 per cent to 24 per cent its own length with an average of 17 per cent longer. Therefore, this character can be used to separate *S. necopina* from the three other species under consideration.

Solenocera necopina Burkenroad Fig. 1, f

Solenocera vioscai Burkenroad, 1936, p. 122.
Solenocera necopina Burkenroad, 1939, p. 7.

Material.—9♂ and 10♀ and several broken shrimps; U.S.N.M. no. 9767; *Albatross* station 2402; Gulf of Mexico.

Burkenroad, 1939, described this species of *Solenocera* from a single subadult female taken at the edge of the Continental Shelf in the Northern Gulf of Mexico in 125 fathoms of water. There were found in the United States National Museum 19 whole and several broken shrimp that were determined as this species. As Burkenroad was unable to give an account of the male petasma there follows a description of this organ.

Median margin of petasma similar to *S. vioscai* Burkenroad in that it is cincinnulated for about two-thirds the length of the petasma and falls considerably below distolateral and distoventral lobes. Distoventral lobe provided with a rounded projection margined with spines. Distolateral lobe divided into two lobules. Lateral lobule slightly shorter than median lobule and distoventral projection; possessing a slender lateral projection which in posterior view is hidden behind projection of distoventral lobe. Median lobule of distolateral lobe broad, subrectangular or club shaped, slightly exceeding lateral lobule and about equal to spinous distoventral projection.

Females in the United States National Museum collection agree with Burkenroad's description of the thelycum except that the sculpture is much more pronounced and the teeth and ridges are more developed in the mature specimens

Males in the series of specimens ranged from a carapace length of 9.8 to 13.1 mm and the females from 11.4 to 18.4 mm all of which appear mature. The largest specimen in the collection, a female, had its carapace so badly crushed as to make accurate measurements impossible.

The orbital angle was described as marked but not acute or produced. In the larger specimens the orbital angle while not sharp or spinelike is definitely produced.

Burkenroad's statement (1939, p. 7) that the postrostral carina does not extend behind the level of the cervical sulcus is erroneous for large specimens as in these there is a definite low carina extending nearly to the posterior margin of the carapace. Burkenroad (*loc. cit.*) states that the first through the third pleonic terga are uncarinated. Here again we find that in large specimens the third pleonic tergite is carinated on its dorsal surface for approximately the posterior two-thirds of its length.

Burkenroad's figure of *S. necopina* does not show a spine or tooth on the posterioventral edge of the sixth pleonic tergite. Our specimens have a spine at this point which compares in size and position to a similar spine in *S. atlantidis.*

In large specimens of *S. atlantidis* the postrostral carina does not extend beyond the cervical sulcus as stated by Burkenroad (*loc. cit.*), but we find that in these same specimens the third pleonic tergite is partially carinate. This carination is not evident in the smaller specimens.

The pterygostomian spine in *S. necopina* is much stronger and possesses a wider base than does this structure in similar sided specimens of *S. atlantidis.*

KEY TO ATLANTIC AMERICAN SOLENOCERA

A. Pterygostomian spine present. No spine on externodistal margin of uropodal exopod.

B. Epipodites X through XIII strongly bifurcate, shorter ramus at least half the length of undivided portion excluding peduncle. Pacific American species.....
.....*agassizii* Faxon, *mutator* Burkenroad, *florea* Burkenroad

BB. Epipodites X through XIII only slightly furcate, shorter ramus not more than one-third the length of undivided portion excluding peduncle. Atlantic American species.

C. Rostral teeth 8 to 10, usually 9. Postrostral carina high and sharp, deeply notched at level of cervical groove.....*vioscai* Burkenroad

CC. Rostral teeth 5 to 7, usually 6. Postrostral carina low or absent, only slightly depressed at level of cervical groove.

D. Antennal scale long, exceeding antennular peduncle by at least 13 per cent its own length. No well defined tooth at orbital angle. Pterygostomian spine large with wide base, joining carapace in a gentle curve.....*necopina* Burkenroad

DD. Antennal scale short, less than antennular peduncle to exceeding antennular peduncle by about 8 per cent of its own length. A well defined tooth at orbital angle. Pterygostomian spine small with narrow base, joining carapace at approximately a right angle.....*atlantidis* Burkenroad

AA. Pterygostomian spine absent. Spine on externodistal margin of uropodal exopod.....*weymouthi*, n. sp.

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ZOOLOGY.—*New genera and species of millipeds from the southern peninsula of Haiti.*[1] H. F. LOOMIS, U. S. Bureau of Plant Industry.

The western end of the southern peninsula of Haiti is an area from which no millipeds ever have been reported. Indeed, this might be said for the entire western half of the peninsula, with the single exception of the high mountain Morne La Hotte, from whose slopes Dr. P. J. Darlington, of the Museum of Comparative Zoology, collected 12 species of millipeds in 1934. Ten of these species proved to be new.[2]

It is only within the last two or three years that an all-weather road leading from Aux Cayes to Jeremie and thence to Anse d'Hainault has given ready access to the interior country hitherto reached only on horseback or afoot from the coastal towns. This road traverses areas having great scientific interest to naturalists, as they contain plants and animals not found elsewhere in Haiti, many of them probably undescribed. A 3-day visit through this country by automobile in the summer of 1940 afforded the writer several opportunities incidental to the object of the trip, to search the humus layer for members of the diplopod fauna. These brief stops, however, resulted in a collection of nine species of millipeds, four of which were new to science, three representing undescribed genera. Two of these genera are of families not previously known from Haiti; in fact, one of them has not before been found in the West Indies, its closest relatives being in California. A new species of *Rhinocricus*, of large size and handsome coloring, was called to my attention by T. A. Fennell, Agricultural Adviser to Haiti, who saw it several weeks prior to the writer's visit while in company with Andre Audant, of the Haitian Department of Agriculture, who warned that the animal had the startling ability of projecting its caustic repugnatorial fluid far from the body and hence was a dangerous creature to handle. In addition to these new forms, a fifth species, previously described, is recorded from Haiti for the first time.

The type specimens of the new species here described are deposited in the U. S. National Museum. Paratype specimens are in the Museum of Comparative Zoology, Cambridge, Mass.

Family SIPHONOPHORIDAE

Siphonophora sp.

Five or six females, not definitely assignable to species from between Chambellan and Dame Marie, August 1, 1940.

[1] Received February 24, 1941.

[2] Bull. Mus. Comp. Zool. 80 (1). 1936.

Family STEMMIULIDAE

Prostemmiulus sp.

A female, the species not identifiable, from between Chambellan and Dame Marie, August 1, 1940.

Family CAMBALOPSIDAE

Cambalomma, n. gen.

Type.—*Cambalomma laevis*, n. sp.

Diagnosis.—The smooth, *Spirostreptus*-like body has the surface of the segments continuous instead of divided into two parts by a transverse constriction; hence, the segments more nearly resemble those of the order Anocheta, but in this respect *Cambalomma* is no more anomalous in the present family than is the genus *Choctella* Chamberlin in the Cambalidae. In other characters *Cambalomma* falls readily into the Cambalopsidae.

Description.—Body of moderate size and rather slender, from 15 to 17 times as long as broad and scarcely constricted behind the first segment; without longitudinal crests or swellings; surface finely shagreened, dully shining.

Head with eyes very well developed and widely separated, composed of numerous ocelli in four series; vertex faintly sulcate at middle; clypeus with two setiferous punctures on each side; labrum with about nine setiferous punctures on each side; antennae slenderly clavate, with a sensory patch of tiny setae at the outer distal end of joints 5 and 6; gnathochilarium with the mentum constricted above the basal half but not transversely divided.

First segment with the sides broadly rounded and clasping the sides of the body; a raised rim proceeding from behind the eye around the lateral limits to the posterior margin.

Ensuing segments with surface continuous, unbroken by a transverse sulcus or constriction dividing each segment into two parts as in other genera; the anterior portion of each segment, that usually covered by the preceding segment, with tiny, fine, undulating, transverse striae; remainder of segment very finely roughened and dully shining; ventral striae pronounced, extending over the posterior half of each segment less than halfway to the pores on the anterior segments and even more restricted on the segments thereafter; pores easily seen, beginning on segment 5 and apparently ending on the antepenultimate segment as no pore is visible on the somewhat telescoped penultimate segment.

Last segment only slightly produced, much exceeded by the inflated anal valves, which meet in a deep groove; preanal scale a narrow ellipse with a pad process at each side projecting from under the margin of the last segment.

Gonopods relatively simple, somewhat resembling those of the genus *Epinannolene* but possibly not fully developed as the last two segments of the largest and oldest male (type) are legless, indicating that the animal lacks one molt of maturity.

First pair of male legs 5-jointed, the coxae with a long process at the base of each on the posterior side, the process projecting downward into a special excavation of the sternum; other male legs normal.

Cambalomma laevis, n. sp.

One male (type) with 61 segments, the last two of which are legless, and five immature females from Jeremie; one mature female from between Chambellan and Dame Marie, August 1, 1940.

Description.—Length of mature female 60 mm, diameter 4 mm; number of segments 62; body very slightly constricted at segments 3 and 4, thereafter with the sides parallel to the posterior fourth from which it narrows gradually; surface of body dully shining but with the head, first segment and the anal segment more brilliantly shining.

Head with antennae slenderly clavate (Fig. 1); joints 2 and 3 thinner and slightly longer than the others, joints 5 and 6 widest and each with a sensory spot of setae at the distal end on the outer side; eyes elongate oval, separated from each other by about twice their longest diameter, composed of 28 to 30 ocelli in four rows with the longest row behind, the rows containing ocelli as follows: 9, 8, 6, 5 or 8, 9, 7, 6; gnathochilarium as shown in Fig. 2.

First segment broadly and evenly rounded on the sides (Fig. 3) and clasping the body; the raised rim extending from behind the eye to the posterior margin, sometimes with two or three tiny rudimentary striae inside it below.

Ensuing segments as described for the genus.

Last segment not much produced, the apex broadly rounded and much exceeded by the inflated and brilliantly shining anal valves, which meet in a deep groove.

Legs with the sterna finely roughened like the dorsal surface of the segments and without striae.

Gonopods as shown in Figs. 4 and 5.

Seventh segment of the male deeply emarginate in front ventrally to receive the tips of the gonopods, the surface behind the emargination specially elevated.

First pair of male legs as shown in Figs. 6 and 7.

Family SPIROBOLIDAE

Rhinocricus modestior Chamberlin

Two specimens from between Camp Perrin and Rivière Glace, July 31, 1940. Other specimens from between Chambellan and Dame Marie, August 1, 1940.

Rhinocricus latespargor, n. sp.

One male (type) and four females from between Camp Perrin and Rivière Glace, July 31, 1940. Collected by T. A. Fennell and H. F. Loomis but first seen several weeks previously by T. A. Fennell.

Diagnosis.—This species may be recognized instantly by its size and striking black and yellow coloration, a combination found in no other West Indian member of the genus.

Description.—Length of the type 145 mm, width 11.5 mm, females to 159 mm long and 14 mm wide; number of segments 53 to 55; color of living ani-

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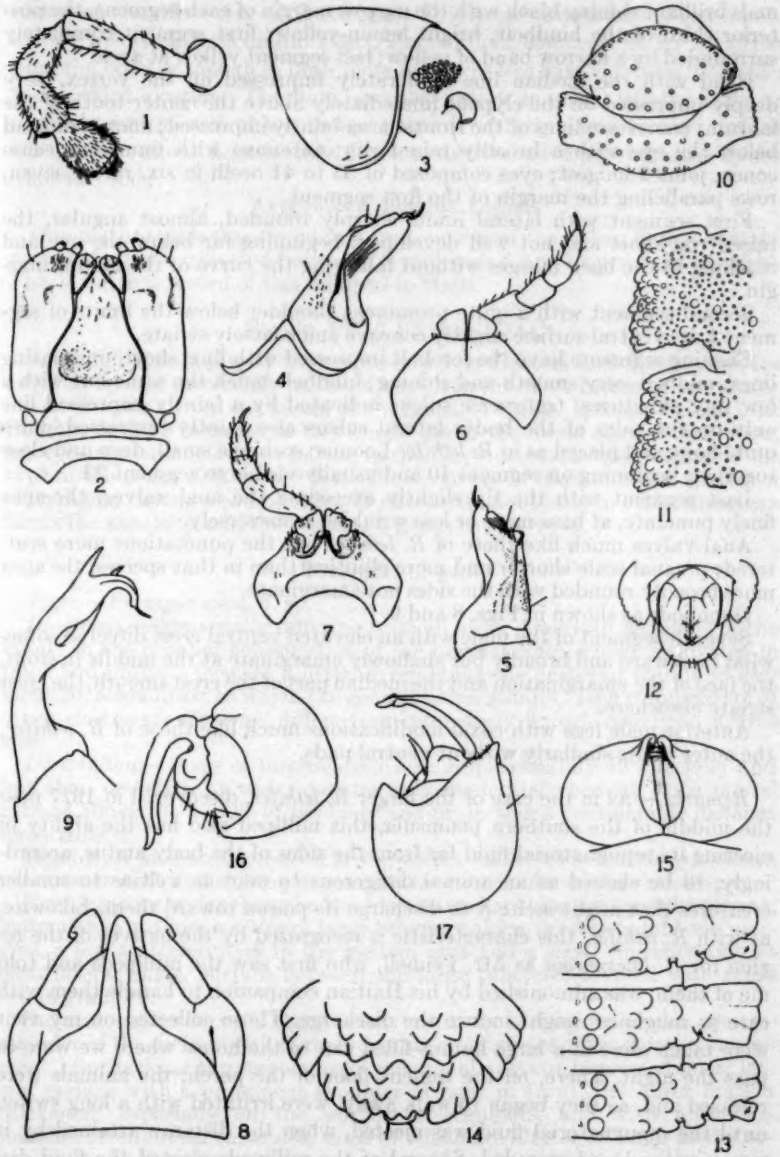
Figs. 1–7.—*Cambalomma laevis*, n. sp.: 1, Antenna; 2, gnathochilarium; 3, first segment and part of head, lateral view; 4, right gonopod with median plate, anterior view; 5, right gonopod, posterior view; 6, first leg and sternal plate of male, anterior view; 7, first leg and sternal plate of male, posterior view.

Figs. 8, 9.—*Rhinocricus latespargor*, n. sp.: 8, Gonopods, anterior view; 9, inner gonopod, anterior view.

Figs. 10–12.—*Proaspis aitia*, n. sp. 10, Head and first two segments, dorsal view; 11, lateral carinae of segments 10 and 11, dorsal view; 12, segments 19 and 20, anal valves and preanal scale, ventral view.

Figs. 13–17.—*Fennellia ovipes*, n. sp.: 13, Right hand half of segments 5, 6, and 7, oblique lateral view; 14, segments 18, 19, and 20, dorsal view; 15, gonopods in normal position inclosing inner joints; 16, right hand gonopod extended, vertical ventral view; 17, gonopod extended, oblique outer view.



Figs. 1–17.—(See opposite page for explanation.)

mals brilliant shining black with the narrow margin of each segment, the posterior third of the hindbelt, bright lemon-yellow; first segment completely surrounded by a narrow band of yellow; last segment yellow at apex.

Head with the median line moderately impressed on the vertex, very deeply impressed on the clypeus immediately above the center tooth of the labrum; transverse lines of the frontal area faintly impressed; margin of head below the eye with a broadly raised rim; antennae with numerous sense cones; joint 2 longest; eyes composed of 33 to 41 ocelli in six, rarely seven, rows paralleling the margin of the first segment.

First segment with lateral limits sharply rounded, almost angular, the raised rim short and not well developed, beginning far below the eye and reaching to the back margin without following the curve of the lateral margin.

Second segment with a quite prominent shoulder below the limits of segment 1, its ventral surface slightly concave and coarsely striate.

Ensuing segments have the forebelt impressed with fine, short, undulating lines; midbelt very smooth and shining; hindbelt much the same but with a few tiny punctures; transverse sulcus indicated by a faintly impressed line only on the sides of the body; lateral sulcus also faintly impressed; pores quite large and placed as in *R. lethifer* Loomis; scobinae small, deep and close together, beginning on segment 10 and usually visible to segment 23.

Last segment with the tip slightly exceeding the anal valves, the apex finely punctate, at base more or less wrinkled transversely.

Anal valves much like those of *R. lethifer* but the punctations more scattered; preanal scale shorter and more elliptical than in that species, the apex more broadly rounded with the sides not emarginate.

Gonopods as shown in Figs. 8 and 9.

Seventh segment of the male with an elevated ventral crest directed somewhat backward and broadly but shallowly emarginate at the middle in front, the face of the emargination and the median part of the crest smooth, the crest striate elsewhere.

Anterior male legs with coxal modifications much like those of *R. lethifer*, the outer joints similarly without ventral pads.

Remarks.—As in the case of the larger *R. lethifer*, discovered in 1927 near the middle of the southern peninsula, this milliped also has the ability of ejecting its repugnatorial fluid far from the sides of the body and is, accordingly, to be classed as an animal dangerous to man as well as to smaller creatures that might incite it to discharge its poison toward them. Likewise, as with *R. lethifer*, this characteristic is recognized by the natives of the region for *R. latespargor* as Mr. Fennell, who first saw the millipeds and told me of them, was admonished by his Haitian companion to handle them with care as roughness might induce the discharge. Those collected on my visit were taken alive in a large humus-filled can to the house where we were to pass the night. There, on the cement floor of the porch, the animals were released and, as they began to walk away, were irritated with a long switch until the repugnatorial fluid was ejected, when the distance attained by it was measured and recorded. Several of the millipeds ejected the fluid distances up to 24 inches from each side of the body but the maximum effort was a double salvo, which sent the discharge 28 inches on one side and 33

inches on the other side of the animal! This same animal had twice, immediately before this maximum effort, ejected fluid distances under 24 inches from the body, although in both these instances less fluid had been used than in the third ejection. The fluid, greenish yellow in color, left the body so suddenly and in such short, fine jets that it scarcely could be seen until it fell on the cement floor in tiny droplets distributed somewhat fanwise far from the body.

Azygobolus tumidus Loomis

One mature male was found in a fruit cluster of the palm, *Bornoa crassispatha* (Martius), collected between Cavaillon and Aux Cayes, July 31, 1940. This is the first record of this milliped in Haiti.

Family PLATYRHACIDAE

Although this family is well represented in Central and South America only one species previously has been known in the West Indies, *Nanorrhacus luciae* (Pocock), from the island of St. Lucia. A Cuban species, which C. H. Bollman in 1888 included in this family under the name *Stenonia maculata*, has recently been shown to belong in the Chytodesmidae and was made the type of the genus *Schizodira*.[3] With the discovery in Haiti of a new species of platyrhacid having a combination of characters not found in other American forms the necessity arises of erecting a genus to receive it.

Proaspis, n. gen.

Type.—*Proaspis ailia*, n. sp.

Diagnosis.—Apparently differing from all other American members of the family in the peculiar construction of the preanal scale, which is elevated in front and projects forward a little, overlapping the posterior margin of segment 20, a condition to which the generic name alludes. In a combination of other characters *Proaspis* differs from previously known American genera also.

Description.—Body of intermediate size, approximately 40 mm long and less than one-sixth as wide; dorsum only moderately convex, with lateral carinae above the middle of the body and projecting a considerable distance away from it.

Head with median depression of the vertex rather wide and deep; labrum concave, smooth and shining in contrast to the granular surface elsewhere.

First segment wider than the head but narrower than the second segment; lenticular in outline; a series of large tubercles along the front and back margins, a few scattered ones in the median area and a small concentration at each lateral angle; surface between the large tubercles covered with small round granules.

Ensuing segments with three transverse rows of large tubercles, the remainder of the surface with numerous smaller tubercles or granules as on segment 1 but lacking any semblance of polygonal areas or impressed lines; lateral carinae with a prominent shoulder at base in front, the outer margin thickened, especially on the poriferous segments, and with numerous rounded or oliviform tubercles, some of which are almost as large as the tubercles of the dorsal rows; pores opening obliquely outward from the margin on all except the last few segments where they are more nearly dorsal; an-

[3] Psyche 48: 35–39. 1941.

terior subsegments densely beset with tiny elongate granules; segment 19 with the lateral carinae produced backward, the posterior limits almost acute; last segment much exceeding segment 19, the posterior margin broadly rounded; dorsal surface granular, lacking large tubercles but it and the margin with definitely placed setae.

Preanal scale slightly elevated in front and a little produced forward, covering the median portion of the ventral margin of segment 20.

Sterna without processes at the base of each leg; surface finely granular.

Segment 3 of the females with the ventral anterior margin emarginate on each side of the middle, the margin behind the excavations strongly raised and thickened, especially that between the two emarginations.

Proaspis aitia, n. sp.

Three females, one the type, collected from beneath loose grass at roadside between Camp Perrin and Rivière Glace, July 31, 1940.

Description.—Length 38 mm, width 6 mm; color dull yellowish white but with an incrustation of reddish-brown, claylike material almost obliterating the body color.

Head and first two segments as shown in Fig. 10; antennae resting in a slight depression laterad of the socket, the depression not sharply limited above or below; distance from each socket to the side of the head equivalent to the distance between the antennae.

Dorsum of segments moderately convex, the lateral carinae projecting almost horizontally from above the middle of the body, their shape and the sculpturing of the body as shown in Fig. 11; posterior end of the body narrowing gradually, beginning with segment 17.

Last segment much prolonged beyond segment 19 and with the posterior end very broadly rounded; dorsal surface granular but lacking large tubercles as on preceding segments, there are, however, two large subterminal dorsal setae with six similar setae projecting from the apical margin and from two to four small setae beneath the apex; below the apical projection and near the margin on each side are two large setae.

Preanal scale, anal valves, and the last two segments are shown in ventral view in Fig. 12.

Family CHYTODESMIDAE

Docodesmus parvior Chamberlin

A male collected at Jeremie and a female collected between Chambellan and Dame Marie, August 1, 1940.

Family STIODESMIDAE

Fennellia, n. gen.

Type.—Fennellia ovipes, n. sp.

Diagnosis.—With the same pore formula as *Psochodesmus* Cook but the body larger and definitely broader, having lateral carinae more extensive and obliquely descending nearly to the level of the legs instead of projecting almost horizontally high on the sides of the body.

Description.—Body with 20 segments, broad, in outline much as in *Docodesmus* Cook, only four or five times longer than its width and less than 10 mm long; the dorsum strongly arched with the lateral carinae descending at an oblique angle almost to the level of the sternal plates.

Head broad, extending far outward from the antennal sockets; vertex

scarcely elevated, strongly erose and granular, medianly channeled; frontal area transversely rugose; clypeal area smooth and shining.

First segment with the thin expanded front margin much as in *Docodesmus* but with 10 instead of 12 scalloped quadrate areas along it; surface with two transverse rows of large tubercles, six in the anterior row, four in the one behind, the surface elsewhere finely granular except the expanded margin, which is almost smooth.

Ensuing segments with four oblique, ascending, longitudinal rows of large tubercles, three tubercles in each row; laterad of each outer row from one to three slightly smaller tubercles usually are present; remainder of dorsal surface of segments dull but not definitely granular; under surface of body finely and evenly reticulated; posterior margin of segments with a prominent lobe at the base of each lateral carina; lateral carinae thin, obliquely descending to near the level of the sterna, the outer margin also oblique with the anterior corner lower than the posterior one; pores opening from large quadrangular processes on segments 5, 7, 9, 10, 12, 13, and 15; carinae of segments 2, 3, 4, 6, 8, 11, and 14 with three outer scallops; segments 16 to 19 inclusive with four outer scallops; segment 5 with a single scallop or lobe in front of the pore callus; other poriferous carinae with two scallops in front of the pore callus.

Last segment small but visible from above between the two short backwardly produced lobes of segment 19; preanal scale triangular.

Gonopods each with a very large hemispherical basal joint capable of wholly containing the outer joint, the two basal joints usually closely applied to each other mesially, almost completely hiding the terminal joints within.

Third segment of the female with a low crescentic ventral ridge behind the genital opening between segments 2 and 3.

This genus is named for T. A. Fennell, my friend and companion on the journey to the southern peninsula of Haiti.

Fennellia ovipes, n. sp.

Two males, one the type, and two females from Jeremie, August 1, 1940.

Description.—Body from 8.5 to 9 mm long and from 1.8 to 2 mm wide; color rather dark dull brown, the large pore calluses colorless in sharp contrast to the rest of the dorsal surface; head with the roughened vertex almost black, the remainder of the head, the antennae, legs, and ventral surfaces colorless.

Body arch high with lateral carinae obliquely descending a considerable distance from the sides of the body as shown in Fig. 13, which also shows the sculpturing of the dorsum and the margins of the segments as well as the shape and position of the pore calluses; posterior end of the body shown in Fig. 14; the last segment has two dorsal tubercles in front which are not visible in the figure, being hidden by the penultimate segment; preanal scale of moderate size, triangular; anal valves flattened, with an indefinite ridgelike swelling down the middle of each; margins rather thin but strongly elevated.

Gonopods as shown in Figs. 15, 16, and 17.

The females have the thin, flattened genital organs protruding from between the second and third segments and directed forward, almost covering the coxal joints of the second legs.

ICHTHYOLOGY.—*The flatfish* Cyclopsetta chittendeni *Bean from Texas, a new record for the fauna of North America.*[1] EARL D. REID, U. S. National Museum. (Communicated by LEONARD P. SCHULTZ.)

A collection of marine and fresh-water fishes from the vicinity of Galveston, Tex., presented to the United States National Museum by J. L. Baughman, of Houston, contained two examples of the rare flounder *Cyclopsetta chittendeni* B. A. Bean[2] collected by the donor on August 11, 1940, near Galveston. Heretofore this species was known only from five specimens from the vicinity of the Island of Trinidad. The Galveston specimens are much smaller than those from Trinidad, being 83 and 91 mm respectively, in standard length. The type, U.S.N.M. no. 44100, is 172 mm while the remaining four examples are 205 to 230 mm in total length, according to J. R. Norman.[3]

The following counts were made: Dorsal rays, 87 and 89; anal rays, 66 and 69; pectoral 15, lateral line 78 and 80; gill rakers 4+8 on first gill arch.

ENTOMOLOGY.—*A revision of the parasitic wasps of the genus* Necremnus *Thomson (Eulophidae; Hymenoptera).*[4] A. B. GAHAN, U. S. Bureau of Entomology and Plant Quarantine. (Communicated by C. F. W. MUESEBECK.)

The genus *Necremnus* contains some species that are parasitic upon insects of economic importance. Eight species, of which four are believed to be new, are treated in the accompanying key.

Family EULOPHIDAE

Genus **Necremnus** Thomson

This genus was said by Thomson to have only one spur on the hind tibia, and Ashmead, in his *Classification of the chalcid-flies* (Mem. Carnegie Mus. 1: 358. 1904), placed it in the tribe Hemiptarsenini, which he distinguished from the tribe Eulophini on the basis of this character. The genotype species, *leucarthros* (Nees), however, has two tibial spurs (one very short and difficult to distinguish), and in the other species two very unequal spurs are discernible on all specimens in which the hind tibiae are in proper position for observation.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received March 25, 1941.
[2] Proc. U. S. Nat. Mus. 17: 635–636, fig. 3. 1895.
[3] *A systematic monograph of the flatfishes (Heterosomata)* 1: 136–137, fig. 89. British Museum, London, 1934.
[4] Received February 25, 1941.

Antenna inserted well below middle of head, not compressed; 9-jointed in the female (scape, pedicel, one distinct ring joint, 3-jointed funicle, and 3-jointed club), apparently 8-jointed in the male (scape, pedicel, apparently without a ring joint, funicle 4-jointed, and club 2-jointed, the first three funicular joints usually each with a branch, or, if unbranched, the scape much enlarged); pronotum short, conical; mesoscutum without parapsidal grooves; scutellum with two pairs of strong setae and without either longitudinal grooves or a transverse furrow; propodeum usually with a median carina but without distinct lateral folds and without well defined spiracular sulci, the spiracles located close to base of propodeum. Wings well developed; submarginal vein not broken; marginal vein shorter than submarginal and two or more times as long as stigmal vein; postmarginal vein at least as long as stigmal, usually distinctly longer. Abdomen subsessile, more or less ovate in outline; only the apex of ovipositor visible.

KEY TO THE SPECIES OF NECREMNUS

1. Funicular joints without rami, scape never much enlarged. Females..2
   Funicular joints 1 to 3 each with a distinct ramus, or, if without rami, then scape greatly enlarged. Males.....9
2. Forewing distinctly marked with fuscous.....3
   Forewing without fuscous markings.....5
3. Forewing with a large fuscous cloud across middle enclosing a hyaline area adjacent to marginal vein and with three fuscous spots near apical margin; second funicular joint testaceous, rest of flagellum blackish..... *maculatipennis* Ashmead
   Infuscation of forewing not as above; second funicular joint concolorous with rest of flagellum.....4
4. Forewing with a large fuscous cloud embracing whole area behind marginal vein; first funicular joint and pedicel subequal..... *californicus* (Girault)
   Forewing with a narrow fuscous spot or incomplete transverse band from stigmal vein and a less distinct fuscous band behind base of marginal vein; first funicular joint nearly twice as long as pedicel..... *comptus*, n. sp.
5. Bright metallic green.....6
   Dark or blackish green, mesoscutum and scutellum sometimes with a coppery tinge.....7
6. Propodeum very weakly sculptured medially and usually with at least slight traces of lateral folds behind middle..... *breviramulus*, n. sp.
   Propodeum distinctly though delicately sculptured medially as well as elsewhere and without traces of lateral folds..... *oregonensis*, n. sp.
7. Postmarginal vein not longer than stigmal vein.... *punctifrons* Thomson
   Postmarginal vein distinctly longer than stigmal vein.....8
8. Abdomen about twice as long as broad; marginal vein fuscous or brownish testaceous..... *leucarthros* (Nees)
   Abdomen about one and one-half times as long as broad; marginal vein pale yellowish..... *duplicatus*, n. sp.
9. Funicular joints without rami; scape greatly enlarged; second funicular joint testaceous, rest of flagellum blackish; wings maculated with fuscous..... *maculatipennis* Ashmead

Funicular joints 1 to 3 with distinct rami; scape usually only slightly broadened; second joint of funicle not differently colored from the others; wings hyaline 10

10. Rami of funicular joints short, not more than three times as long as the segments from which they originate and never extending nearly to apex of club 11

Rami of funicular joints long, four or more times as long as the segments from which they originate and all extending to apex of club or nearly so 12

11. Rami of funicle very short, not twice as long as supporting segments and much less than half as long as flagellum ..... *breviramulus*, n. sp.

Rami of funicle about two and one-half to three times as long as supporting segments, the longest approximately half as long as flagellum ..... *oregonensis*, n. sp.

12. Rami of funicle slender, cylindrical, and clothed with long, slender hairs 13

Rami of funicle more or less compressed, nearly as thick as funicular joints, and without long slender hairs, but rather densely clothed with short coarse and more or less recumbent hairs .... *leucarthros* (Nees)

13. Postmarginal vein not longer than stigmal ..... *punctifrons* Thomson

Postmarginal vein distinctly longer than stigmal ..... *duplicatus*, n. sp.

Necremnus maculatipennis Ashmead

Necremnus maculatipennis Ashmead, Fauna Hawaiiensis 1: 331. 1901.

This species, described from Hawaii, is represented in the U. S. National Museum by the male and female types. The male differs from typical *Necremnus* by having the antennal scape greatly enlarged and compressed and the joints of the funicle entirely without rami. The female appears to be typical of the genus and the male differs in no way, except in the antennae.

In both sexes the front wing has a large fuscous cloud in the disk enclosing a hyaline area adjacent to the marginal vein, and there are also three fuscous spots near the apical margin. The second funicular joint is testaceous, the rest of the flagellum black.

Necremnus californicus (Girault), n. comb.

Eulophus californicus Girault, Proc. U. S. Nat. Mus. 53: 446. 1917.

The type of this species lacks the head, abdomen, and wings. The head and wings are mounted on a slide, the head crushed beneath the cover glass.

It may be distinguished from the other species treated herein by the large discoidal cloud covering the whole width of the wing behind the marginal vein. The scape is cylindrical, the pedicel more than twice as long as broad. The single ring joint is about half as long as broad. The first funicular joint is very slightly longer than the pedicel and about twice as long as broad at apex, the second joint a little longer than broad and the third subquadrate. The club is a little longer than the two preceding joints combined and very slightly broader than the last funicular joint. The propodeum is practically smooth, the median carina barely indicated, and the lateral folds and spiracular sulci are entirely absent.

Necremnus comptus, n. sp.

The bimaculate forewing, relatively long and pointed abdomen, and the mostly yellow hind tibia will distinguish this species from all others known to me.

Female.—Length 2.6 mm. Head as broad as thorax and nearly uniformly strongly reticulate-punctate; ocelli in a low triangle; lateral ocellus about twice its own diameter from eye margin; eyes with short pile; antennae inserted very slightly below a line connecting lower extremities of eyes, 9-jointed; scape subcylindrical, reaching to front ocellus, about five times as long as broad; pedicel about twice as long as broad; ring joint transverse; first funicular joint nearly twice as long as pedicel and about two and one-half times as long as broad; second and third funicular joints equal and each about twice as long as broad; club distinctly 3-jointed, no thicker than funicle, about equal in length to two preceding joints combined, the basal joint longer than broad, second joint subquadrate, apical joint conical, a little shorter than penultimate and terminating in a short spine. Thorax strongly reticulate punctate, the punctures on scutellum and axillae a little finer than those on mesoscutum; prepectus more coarsely sculptured than rest of pleuron; postscutellum about as long as propodeum and sculptured like scutellum; propodeum with very distinct and nearly uniform, fine, reticulate-punctate sculpture, with a distinct median carina and with traces of both lateral folds and spiracular sulci but these not distinctly impressed. Forewing extending about to apex of abdomen, its length to breadth about as 24 to 9; marginal, postmarginal, and stigmal veins approximately in the proportion of 25, 15, and 10, respectively. Abdomen longer than head and thorax combined, a little narrower than thorax, and fully three times as long as broad, the basal tergite smooth, the other tergites more or less sculptured; tip of ovipositor sheaths protruding a little beyond apex of abdomen.

General color greenish black; head below antennae, front coxae, mesosternum, and dorsum of abdomen tinged with coppery; propodeum metallic green; antennae entirely black; mandibles testaceous; coxae, trochanters, and femora black; tibiae yellow, the middle and posterior pairs with a little more than the apical one-third black; tarsi yellowish, the last two or three segments of each more or less fuscous; forewing subhyaline with a weak fuscous band at base of marginal vein and another incomplete one below stigmal vein; venation dark testaceous; hind wing hyaline.

Type locality.—San Francisco, Calif.

Type.—U.S.N.M. no. 54701.

Described from one female collected May 13, 1915, by E. P. Van Duzee.

Necremnus breviramulus, n. sp.

The male of this species is easily distinguished from other known males of the genus by the very short rami of the funicular joints. These branches are subequal and each less than twice the length of the main body of the segment from which it originates. The female differs from *maculatipennis* Ashmead and *californicus* (Girault) by having the forewings without infuscation, and it may be distinguished from *leucarthros* (Nees) by the much brighter metallic-green color of the body, by the somewhat shorter antennae, and by the less extensive infuscation of the posterior tarsi.

Female.—Length 2.2 mm. Head transverse, about as wide as thorax; lateral ocellus about twice its own diameter from eye margin; eyes with a few very short cilia; antennae inserted on or very slightly below a line joining the lower margins of the eyes, 9-jointed; scape subcylindrical, not attaining level of vertex; pedicel about one and one-half times as long as broad at apex; ring joint transverse, distinct; first funicular joint subequal in length to pedicel but slightly thicker; second and third joints of funicle each about as long as broad and very slightly shorter than first; club distinctly 3-jointed

and a little longer than the two preceding funicle joints combined, terminating in a distinct short spine. Whole head with fine, shallow, reticulate-punctate sculpture. Thorax sculptured about like the head; postscutellum about two-thirds as long as propodeum and sculptured like scutellum; propodeum with a distinct though delicate median longitudinal carina, without complete lateral folds but usually with distinct traces of them posteriorly, without spiracular sulci, and with its surface delicately reticulated, this sculpture very weak medially; prepectus distinctly more coarsely sculptured than rest of pleuron, the mesepimeron mostly smooth. Forewing extending beyond apex of abdomen, its length to breadth about as 22:9; marginal, postmarginal, and stigmal veins in about the proportions of 22, 10, and 7, respectively. Abdomen ovate, about twice as long as broad and about as long as head and thorax combined, nearly smooth but with some weak lineolation on the last three or four tergites; only the tip of ovipositor sheath exserted.

Head, thorax, and abdomen brilliant metallic green; antennal flagellum brownish; scape and pedicel metallic green; mandibles yellowish; legs metallic green or metallic fuscous, but with all trochanters, apices of all femora, anterior tibiae except ventrally, and middle and posterior tibiae at bases and apices pale yellow or whitish; each tarsus usually with the two basal joints white, the two apical joints fuscous; wings hyaline; venation pale yellowish; tegulae metallic green; abdomen beneath less brilliantly metallic than above.

Male.—Length 1.6 mm. Antennal scape slightly thickened, about two and one-half times as long as broad; pedicel only a little longer than broad; ring joint apparently obsolete; first three joints of flagellum each about as broad as long and each with a short thick ramus originating at its base and extending beyond its apex approximately to apex of following segment; fourth flagellar joint about one and one-half times as long as thick, distinctly separated from the preceding and the following joints by short petioles and without a ramus; fifth and sixth flagellar joints separated only by a distinct groove, together forming a club which is approximately one and one-half times as long as the fourth flagellar joint and slightly constricted at apex but without the distinct terminal spine which is present in the female. The abdomen is about as long as the thorax. In other respects the male is like the female.

Type locality.—Lawrence, Kans.

Type.—U.S.N.M. no. 54702.

Described from 31 females (1 holotype) and 8 males (1 allotype) said to have been reared from pupae of *Hypera eximius* Lec., June 6, 1936, by L. S. Henderson. The holotype, allotype, and 18 paratypes are deposited in the U. S. National Museum. Fifteen female and 4 male paratypes have been returned to the University of Kansas, whence the material was originally received.

Two females and 1 male reared at Pegrim, Ill., in October 1905 from *Hypera comptus* (Say) by E. S. G. Titus are in the U. S. National Museum collection and are almost certainly this species but are not considered a part of the type material.

Necremnus oregonensis, n. sp.

Necremnus sp. Chamberlin, Proc. Ent. Soc. Washington 35: 107. 1933.

In color, size, and most every other respect, this species agrees with the description of *breviramulus*, but it differs from that species in the following particulars: Antenna of male with branches of funicular joints each about two and one-half to three times as long as the segment from which they orig-

inate and always extending well beyond the apex of the segment which follows; fourth flagellar joint of male more than twice as long as broad; first funicular joint of female distinctly a little longer than pedicel and about twice as long as broad; propodeum in both sexes with nearly uniform, distinct, fine, reticulate-punctate sculpture and without definite traces of the lateral folds.

Type locality.—Richmond, Oreg.

Type.—U.S.N.M. no. 54703.

Described from 5 females (1 holotype) and 2 males (1 allotype) reared in July 1930 and June 1931 from *Hypera rumicis* (L.) by T. R. Chamberlin; also 2 females and 5 males reared July 5, 1931, by Chamberlin from material of *Hypera* sp. collected in the type locality.

Necremnus punctifrons Thomson

Necremnus punctifrons Thomson, Hym. Scand. 5: 235. 1878.

According to the description, this European species has the postmarginal vein not longer than the stigmal, in which respect it differs from all the other species here treated. It is not known to occur in America and has not been seen by the writer.

Necremnus leucarthros (Nees)

Eulophus leucarthros Nees, Hym. Ichneumon. affin. Mongr. 2: 172. 1834.

Eulophus hippias Walker, Mongr. Chalcid. 1: 185. 1839.

Eulophus amempsimus Walker, Mongr. Chalcid. 1: 186. 1839; Dalla Torre, Cat. Hym. 5: 58. 1878; Thorpe, Proc. Ent. Soc. London 5 (pt. 2): 30. 1930; Donisthorpe, Ent. Rec. and Journ. Variation 50: 74. 1938. (New synonymy.)

Necremnus leucarthros (Nees) Thomson, Hym. Scand. 5: 234. 1878; Dalla Torre, Cat. Hym. 5: 7. 1898; Ruschka and Fulmek, Zeitsch. Angew. Ent. 2: 398. 1915; Graham-Smith, Parasitology 11: 371–383. 1919; Chamberlin, Journ. Econ. Ent. 17: 629. 1924; Proc. Ent. Soc. Washington 27: 142. 1925.

The type of *Eulophus leucarthros* Nees has not been seen by the writer, the present interpretation of the species being based on specimens identified by Thomson, Ruschka, and Schmiedeknecht. *Eulophus hippias* Walker was placed by Thomson as a questionable synonym of *leucarthros*. The type of *hippias* in the British Museum was studied in 1927 and found to be the same as the current interpretation of *leucarthros*. On the same occasion the types of *Eulophus amempsimus* Walker were examined, and that species is also believed to be the same as *leucarthros*.

Necremnus leucarthros was reared at the Salt Lake, Utah, Laboratory of the Bureau of Entomology from material imported from Europe in connection with the introduction of parasites for control of the alfalfa weevil, *Hypera variabilis* (Hbst.), but is not known to have been released in this country. The species is recorded by Ruschka and Fulmek as parasitizing *Lema cyanella* (L.) and by Graham-Smith as attacking Diptera. Thorpe records *Eulophus amempsimus* from *Hyponomeuta padellus* (L.) and Donisthorpe cites it as a parasite of *Quedius brevis* Er.

Necremnus duplicatus, n. sp.

This species is extremely like *leucarthros* but may be distinguished in the male by the fact that the rami of the funicle joints are slender, cylindrical,

and sparsely clothed with long hairs. The female is not easily distinguished from *leucarthros*, differing, so far as I can see, only by being somewhat more robust, by having the abdomen broader in proportion to its length, and by the marginal vein being pale yellowish instead of brownish fuscous. The male antenna agrees with Thomson's characterization of *punctifrons*, but the postmarginal vein in that species is stated to be not longer than the stigmal, whereas in this species it is nearly one and one-half times as long as the stigmal.

Female.—Length 2.15 mm. Head transverse, about as wide as thorax, viewed from in front a little broader than high; ocelli in a low triangle; lateral ocellus about twice its own diameter from eye margin; eyes with sparse short pile; antennae inserted very slightly above a line connecting lower margins of eyes, 9-jointed; scape subcylindrical, slightly compressed, attaining to level of anterior ocellus; pedicel not quite twice as long as broad, shorter and narrower than first funicular joint; ring joint strongly transverse; first funicular joint fully twice as long as broad; second and third joints of funicle subequal, each distinctly longer than broad but a little shorter than first; club very distinctly 3-jointed, about as long as two preceding joints combined and scarcely thicker than funicle, the first two joints subequal, the third joint smaller and terminating in a short spine. Whole head finely reticulate-punctate. Thorax sculptured about like head, the punctation on scutellum and axillae distinctly a little finer than on mesoscutum; postscutellum nearly as long as propodeum on median line and sculptured like scutellum; propodeum with a delicate median carina, usually without lateral folds but occasionally with faint traces of them posteriorly, without spiracular sulci, and with its surface uniformly very indistinctly reticulated, nearly smooth; prepectus more strongly sculptured than rest of pleuron; mesepimeron on upper half perfectly smooth. Forewing extending beyond apex of abdomen, its length to breadth about as 26 to 11; marginal, postmarginal, and stigmal veins about in the proportions of 27, 14, and 10, respectively. Abdomen broadly ovate, about as long as head and thorax combined and approximately one and one-half times as long as broad, the basal four segments practically smooth, those beyond the fourth weakly sculptured; only the apex of ovipositor sheath exposed.

Head and thorax dark green, more or less strongly tinged with coppery below antennae and on scutellum, axillae, and mesepimeron; mandibles yellowish; antennal scape and pedicel greenish black, flagellum brownish black; wings hyaline, the venation pale yellowish with the stigmal knob dark brown; all coxae concolorous with thorax, the anterior and median pairs tinged with coppery; trochanters dark; all femora greenish black with their apices narrowly yellow; front tibia blackish but with a pale-yellowish stripe on outer margin extending from base to apex; middle and posterior tibiae black with a narrow yellowish band at base of each; anterior tarsi wholly dark brown; middle and posterior tarsi with basal joint pale, the three following joints brownish or blackish; abdomen dark metallic green above, but with apex of first and greater part of second, third, and fourth tergites copper colored; ventral side of abdomen nearly black.

Male.—Length 1.7 mm. Antennal scape not thickened, four or five times as long as broad; pedicel about one and one-half times as long as broad; ring joint obsolete; first funicular joint a little longer than pedicel and with a long, slender, cylindrical branch originating at its base and reaching very nearly to apex of flagellum; second funicular joint a little longer than first and with a similar branch originating somewhat beyond its base and likewise extend-

ing nearly to apex of flagellum; third joint a little longer than second, with its branch originating about at its middle and attaining to about the same point as the others; all the funicular rami sparsely clothed with long fine hairs; fourth joint of funicle nearly four times as long as broad, thicker toward apex than at base, and without a branch; club 2-jointed, a little thicker and very slightly longer than fourth funicular joint, its apical joint about half as long as the basal one and terminating in a very short spine; abdomen elliptical, about as long as thorax and about twice as long as broad, with its dorsum mostly dark cupreus. Otherwise like the female except less robust.

Type locality.—Mount Vernon, Wash.

Type.—U.S.N.M. no. 54704.

Described from 20 females (1 holotype) and 21 males (1 allotype) reared from *Ceutorhynchus assimilis* (Payk.) in turnip seed pods July 3, 1937, by A. J. Hanson. A male and a female reared July 17–19, 1937, by H. L. Parker, under European Parasite Laboratory no. 4377 from "Cruciferae pods" from Holland, seem to be this same species but are not considered a part of the type series. Also in the collection are 8 specimens, believed to be this species, from Oakley, Hollister, Roseworth, and Castleford, Idaho, all swept from or collected on *Sophia sophia* and *Sisymbrium altissimum* in June 1937 and in May and June 1931. The specimens collected in 1931 were taken by David E. Fox, but the collector of the earlier specimens is not known.

ENTOMOLOGY.—*Revision of the Nearctic Megophthalminae (Homoptera: Cicadellidae).*[1] P. W. OMAN, U. S. Bureau of Entomology and Plant Quarantine.

This paper deals with the North American leafhoppers heretofore assigned to the genus *Paropulopa* Fieber. According to the present interpretation none of the seven known species, representing two genera herein described, is congeneric with the European *Paropulopa lineata* Fieber, 1866, genotype of *Paropulopa*.

Paropulopa lineata Fieber has no ocelli, the ocellar vestiges being on the crown rather than on the face, whereas in all the North American species of Megophthalminae the ocelli are present and located on the face. This character is sufficient to distinguish the North American forms from *Paropulopa*, and they may be differentiated from *Megophthalmus* Curtis,[2] to which they seem more closely related, by the fact that the carinae replacing the frontal and epicranial sutures are not foliaceously produced. Because these leafhoppers are rather rare in collections and the characters of the subfamily are not well known, the following résumé of the characters common to the North American representatives seems appropriate.

Relatively small, robust leafhoppers (2.5–5 mm in length); color some shade of cinereous, brown, or fuscous; head, including eyes,

[1] Received February 26, 1941.

[2] *Megophthalmus* Curtis, January 1833, genotype (*Megophthalmus bipunctatus* Curtis, 1833) = *Cicada scanica* Fallen, 1806; synonym *Paropia* Germar, March 1833, genotype (*Cicada*) *Ulopa scanica* (Fallen), 1806 (= *Coelidia ? scutata* Germar, 1821).

distinctly wider than pronotum; eyes somewhat bulbous; clypeal suture distinct; frontal sutures replaced by carinae above antennal pits; clypellus elongate and narrowed slightly both basally and distally, extending well beyond the normal curve of the genae; gena strongly emarginate below eye; length of antenna about one-half width of head; antennal pit shallow, with only a very small ledge above; distance between ocelli equal to or greater than distance from ocellus to eye; ocellus located at the inner end of a more or less distinct transverse depression formed by the frontal carina and the dorsal margin of the face, the ocellus thus directed laterad or laterocephalad; head, pronotum, scutellum, and at least basal portion of forewing, excepting the veins, with numerous small, circular pits; forewing subcoriaceous, veins usually rather prominent, appendix absent.

In distribution the species treated in this paper appear limited to California and adjacent Mexico west of the Sierras, and locality records given for the various species are in California unless otherwise indicated.

The illustrations accompanying this paper were made on coordinate paper with the aid of a micrometer scale placed in the ocular of a compound microscope. Corresponding parts are drawn to the same scale and therefore give an accurate idea of the relative size of the various structures in the different species. For convenience in examining these figures corresponding structures are indicated by the same letter, as follows: A, lateral view of dorsal spine; B, dorsal view of style and connective; C, lateral view of aedeagus; D, ventral view of male plates, from dissected specimens; E, dorsal view of head, pronotum, and scutellum; F, ventral view of female sternite VI; G, ventral view of female sternite VII. These letters are in each instance associated with a number indicating the species, as follows: 1, *Brenda arborea* (Ball); 2, *Tiaja mexicana* (Ball); 3, *T. interrupta* (Ball); 4, *T. californica* (Ball); 5, *T. ventura*, n. sp.; 6, *T. friscana* (Ball); 7, *T. montara*, n. sp.

In choosing the cotype specimens herein designated as lectotypes of the various species, I have in each case selected the specimen to which Ball had attached his name label.

KEY TO GENERA AND SPECIES OF NEARCTIC MEGOPHTHALMINAE

a^1. Hindwings fully developed. Crown broad and short, median length not greater than length next to eye (Fig. 1E)..... *Brenda*, n. gen.
One species, *Brenda arborea* (Ball)

a^2. Hindwings rudimentary. Crown distinctly longer medially than next to eye (Fig. 4E)..... *Tiaja*, n. gen.

b^1. Vein Cu_2 not forming a claval suture but evident as a vein throughout its length. Veins adjacent to Cu_2 (Cu_1 and first claval) at no point elevated above level of Cu_2..... *T. mexicana* (Ball)

b^2. Vein Cu_2 either obscure or appearing as the claval suture for at least part of its length. Veins adjacent to Cu_2 (Cu_1 and first claval) usually distinctly elevated above level of Cu_2 opposite the furcation of radius and media.

c^1. Sternite VII of female usually visible only laterally, always shorter medially than laterally and median length always less than median length of sternite VI. Male plates rather small, appearing (unless relaxed and dissected) subtruncate distally. Dorsal spine slender, distal portion attenuated..... *T. interrupta* (Ball)

c^2. Sternite VII of female visible throughout its width, not shorter medially than laterally, or if so due to a broad, shallow, median emargination posteriorly and then with median length equal to or greater than median length of sternite VI. Male plates large, never appearing subtruncate, but with caudolateral margins deflexed. Dorsal spine stout, distal portion not attenuated.

d^1. Sternite VII of female with a median **U**-shaped emargination posteriorly (Fig. 4G). Dorsal spine with four hooklike points distally (Fig. 4A)..... *T. californica* (Ball)

d^2. Sternite VII of female without a median **U**-shaped emargination posteriorly. Dorsal spine with not more than three points distally.

e^1. Females.

f^1. Sternite VII truncate or nearly so. Basal margins of pygofer exposed.

g^1. Basal margins of pygofer not deflexed... *T. ventura*, n. sp.

g^2. Basal margins of pygofer strongly deflexed..... *T. friscana* (Ball)

f^2. Sternite VII with a broad, shallow, median emargination posteriorly. Basal margins of pygofer covered by sternite VII..... *T. montara*, n. sp.

e^2. Males.

h^1. Style not extending beyond apex of plate..... *T. ventura*, n. sp.

h^2. Style extending well beyond apex of plate.

i^1. Style with distal portion attenuated (Fig. 6B)..... *T. friscana* (Ball)

i^2. Style with distal portion expanded (Fig. 7B)..... *T. montara*, n. sp.

Brenda, n. gen.

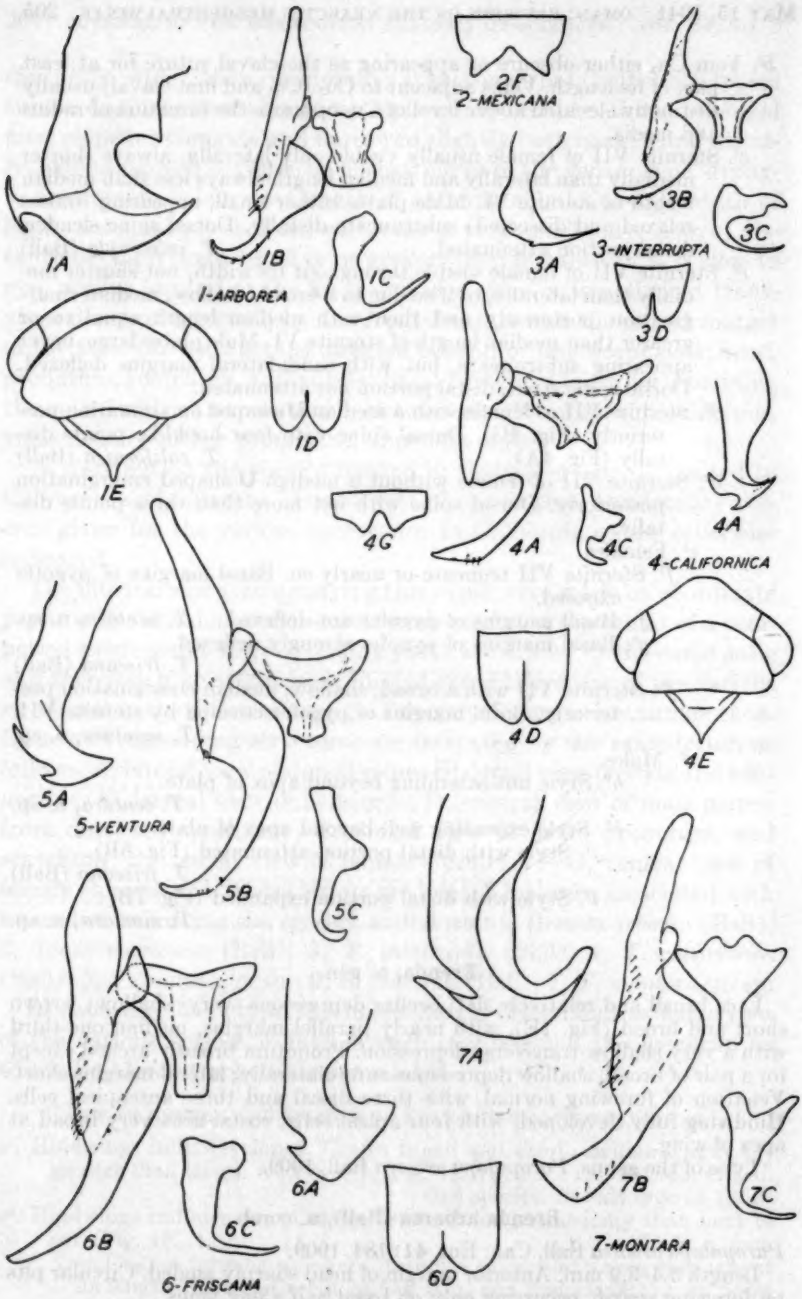
Face broad and relatively flat; ocellar depressions very shallow; crown short and broad (Fig. 1E), with nearly parallel margins, median one-third with a very shallow transverse depression. Pronotum broadly arched except for a pair of broad, shallow depressions anterolaterally; lateral margins short. Venation of forewing normal, with three discal and three anteapical cells. Hindwing fully developed, with four apical cells; costal area very broad at apex of wing.

Type of the genus, *Paropulopa arborea* Ball, 1909.

Brenda arborea (Ball), n. comb.

Paropulopa arborea Ball, Can. Ent. **41**: 184. 1909.

Length 3.4–3.9 mm. Anterior margin of head sharply angled. Circular pits on forewing sparse, occurring only on basal half along veins.



Figs. 1–7.—(See opposite page for explanation.)

Color variable, usually some shade of brown and typically golden-brown, but frequently with considerable cinereous. Fuscous marks, if present, always more extensive on the venter; on the dorsum usually confined to the circular pits but occasionally forming a faint and poorly outlined band across middle of forewing.

Sternite VII of female very short, usually less than one-third the length of sternite VI and frequently not apparent as a separate sternite, posterior margin truncate. Basal portions of ovipositor, ovipositor sheath, and pygofer exposed. Male valve small, nearly quadrangular in outline. Male plates small, rounded distally (Fig. 1D). Dorsal spine heavily sclerotized and pigmented, usually visible without dissection, in lateral view as illustrated (Fig. 1A). Style, connective, and aedeagus relatively simple, outlines as illustrated (Figs. 1B, 1C).

Distribution.—Cold Springs, Sequoia National Forest (Oman); Colfax (Ball); El Portal (Oman); Palo Alto (Oman); Sloughhouse (Cartwright); Towle (Beamer); Watsonville (Ball); Yosemite Valley (Beamer). All these localities are in central California west of the Sierras. April 29 to August 20. 62 specimens examined.

Lectotype female labeled "Colfax, Cal. 23 Je. 08" in the E. D. Ball collection, U. S. National Museum.

Tiaja, n. gen.

Face moderately convex below the level of the antennal pits, above this line with a distinct median depression between the two rather deep ocellar depressions; crown distinctly longer medially than next to eye (Fig. 4E), nearly flat or with a shallow depressed area on disk. Pronotum scarcely arched, slightly elevated along the median line, thus accentuating somewhat the broad, shallow, antero-lateral depressions; lateral margins short; posterior margin truncate or slightly emarginate medially. Venation of forewing frequently irregular and usually with additional cross veins in the apical portion. Hindwings rudimentary.

Type of the genus, *Paropulopa californica* Ball, 1909.

Tiaja mexicana (Ball), n. comb.

Paropulopa mexicana Ball, Can. Ent. **34**: 22. 1902.

Length 3.6 mm. Clypeus comparatively tumid; frontal carinae not so prominent as is usual in the genus; anterior margin of head rather blunt. Forewing long and rather narrow, distally narrowing about equally from both margins; apex bluntly pointed; Cu_2 evident as a distinct vein, not as the claval suture; circular pits distributed rather evenly over entire forewing.

Color testaceous-brown, irregularly marked with fuscous on head and pronotum. Media of forewing marked with brown on distal half.

Sternite VII of female evident only as a broad, somewhat membranous flap medially, almost completely covered by the large sternite VI, the posterior margin of which is produced into a pair of bluntly pointed, divergent, triangular projections laterally, thus forming a broad, flaring V-shaped median emargination (Fig. 2F). Male unknown.

Distribution.—Sierra Madre Mountains, Chihuahua, Mexico, altitude about 7,200 feet. Date unknown. Known only from two female cotypes.

Lectotype female labeled "Sr. Madre Mts. Mex." in the E. D. Ball collection, U. S. National Museum.

Figs. 1–7.—Leafhoppers of the subfamily Megophthalminae: 1, *Brenda arborea* (Ball); 2–7 species of *Tiaja*. For identification of various detailed drawings see explanation in introductory remarks.

Tiaja interrupta (Ball), n. comb.

Paropulopa interrupta Ball, Can. Ent. **34**: 21. 1902.

Length 2.5–3 mm. Anterior margin of head somewhat variable but usually rather sharp, always more distinctly angled than in *mexicana*. Forewing with costal margin more strongly curved than commissural margin; apex bluntly pointed; claval suture (Cu_2) rather obscure basally; Cu_1 and 1st claval slightly elevated above Cu_2 opposite furcation of radius and media; circular pits rather sparse and arranged mostly in single rows along veins.

Color very variable, showing almost every possible intergradation from uniform pale testaceous-brown or cinereous with a few fuscous marks to fuscous with a few cinereous marks, typically about equally fuscous and cinereous with an irregularly mottled appearance.

Sternite VII of female very short, usually visible for its entire length but occasionally visible only laterally. Male valve small, truncate posteriorly, a little wider basally than distally. Male plates small appearing (unless relaxed and dissected) subtruncate distally and with lateral margins nearly straight, in dissected specimens outline as illustrated (Fig. 3D). Dorsal spine with distal portion attenuated and with a pair of small, blunt, hook-like projections on the ventral surface, in lateral view as illustrated (Fig. 3A). Style, connective, and aedeagus simple, outlines as illustrated (Figs. 3B, 3C).

Distribution.—Beaumont (Ball); Cabazon (Ball); Carlsbad (Beamer); Cuyamaca Lake (Beamer); Del Mar (Oman); Hurkey Creek, San Jacinto Mts. (Oman); Jacumba (Oman); La Mesa (Ball); Los Angeles Co. (Coquillett, Koebele); Miramar (Beamer); Newton (Oman); Ontario (Ball); Pasadena (Ball, Fall); San Diego (Ball, Beamer); Tia Juana (Ball). MEXICO: Tia Juana (Ball). Apparently confined to rather low altitudes in southern California and adjacent Mexico west of the Imperial Valley. June 1 to August 6; 135 specimens examined.

Lectotype female labeled "Los Angeles Co., Cal., Collection Coquillett" in the U. S. National Museum, no. 6096.

Tiaja californica (Ball), n. comb.

Paropulopa californica Ball, Can. Ent. **41**: 184. 1909.

Length 2.8–3.2 mm. Head, pronotum, and scutellum as illustrated (Fig. 4E). Anterior margin of head distinctly angled. Forewing usually with costal margin distally more strongly curved than commissural margin, sometimes the two margins about equally curved; apex bluntly pointed; Cu_2 and circular pits as in *interrupta*.

Color varying from uniform pale testaceous-brown or uniform cinereous with a few brown marks to brownish fuscous with numerous cinereous marks, typically the ground color of pale testaceous-brown and cinereous with irregular markings of fuscous and brown.

Sternite VII of female short laterally, posterior margin with a bluntly rounded projection each side of a flaring U-shaped median emargination (Fig. 4G). Male valve short, truncate posteriorly and distinctly broader basally than distally. Male plates rather large, appearing (unless relaxed and dissected) nearly parallel sided, distally rounded and but little incised on median line, caudo-lateral margins slightly deflexed, in dissected specimens the outline as illustrated (Fig. 4D). Dorsal spine ending in four hook-like points, two rather long and directed caudad, two short and directed cephalad (Fig. 4A). Style, connective, and aedeagus as illustrated in outline (Figs. 4B, 4C), the aedeagus unusually small in comparison with the aedeagi of other members of the genus.

Distribution.—Burlingame (Oman); Honda (Oman); Leona Heights (Beamer); Montara (Oman); Monterey (Beamer); Niles (Beamer); Salinas (Ball); Sargent (Beamer). These localities are all in the low hills south and east of San Francisco Bay. April 26 to July 22; 182 specimens examined.

Lectotype female labeled "Salinas, Cal., 20 Je. '08, E. D. Ball Collector" in the E. D. Ball collection, U. S. National Museum.

Tiaja ventura, n. sp.

Length 3.2–4 mm. Frontal carinae prominent; anterior margin of head sharply angled, occasionally subfoliaceous. Forewing with costal margin distally more strongly curved than commissural margin; apex bluntly pointed; Cu_1 and 1st claval distinctly elevated above claval suture opposite furcation of radius and media; circular pits obscure but present along veins.

Color cinereous, sometimes tinged with testaceous-brown, and usually irregularly marked with brown or fuscous.

Sternite VII of female short, posterior margin truncate or nearly so. Exposed basal margins of female pygofer slightly thickened but not deflexed. Male plates as in *californica* but proportionately a little broader. Dorsal spine with one rather blunt point and two hook-like projections distally, in lateral view as illustrated (Fig. 5A). Style, connective, and aedeagus as illustrated in outline (Figs. 5B, 5C).

Distribution.—Gaviota (Beamer); Oxnard (Ball); Pismo Beach (Beamer); Santa Barbara (Ball). All these localities are along the coast north of Los Angeles. April 25 to July 25; 198 specimens examined.

Holotype male, allotype female, and numerous paratypes of both sexes from Pismo Beach, Calif., July 19, 1933, R. H. Beamer. Holotype, allotype, and paratypes in collection of University of Kansas, paratypes in collection of U. S. National Museum, no. 55132.

For this species I have adopted the manuscript name applied to it by Dr. E. D. Ball, who recognized it as new.

Tiaja friscana (Ball), n. comb.

Paropulopa friscana Ball, Can. Ent. **41**: 183. 1909.

Length 4–5 mm. Anterior margin of head sharply angled but not so thin as in *ventura;* crown proportionately much shorter than in Fig. 4E (*californica*) but always distinctly longer medially than next to eye. Forewing with costal and commissural margins about equally curved distally; apex blunt, scarcely pointed; claval suture (Cu_2) obscure basally; Cu_1 and 1st claval usually distinctly elevated above level of Cu_2 opposite furcation of radius and media; circular pits not restricted to rows along veins.

Color pale testaceous-brown or cinereous with irregular brown or fuscous marks. Apparently not so variable in color as *interrupta* and *californica.*

Sternite VII of female short, posterior margin truncate and usually slightly deflexed, at least medially. Exposed basal margins of female pygofer strongly deflexed. Male valve broad and very short, basal margin but little longer than distal margin. Male plates broad, apices broadly rounded and separated by a flaring V-shaped median incision distally (Fig. 6D), the caudolateral margins strongly deflexed. Dorsal spine heavily sclerotized and pigmented, visible without dissection, in lateral view as illustrated (Fig. 6A). Style long, distal portion attenuated, heavily sclerotized and pigmented and extending well beyond plate, outline of style and connective as illustrated (Fig. 6B). Aedeagus as illustrated in outline (Fig. 6C).

Distribution.—Known only from the San Francisco Bay region (Ball,

Beamer, Bridwell, Oman, Van Duzee). March 30 to September 9; 34 specimens examined.

Lectotype female labeled "S. Francisco, Cal., 27 Ap. 08, E. D. Ball Collector" in the E. D. Ball collection, U. S. National Museum.

Tiaja montara, n. sp.

Length 3.8–4.1 mm. Anterior margin of head sharply angled; crown proportionately much shorter than in Fig. 4E (*californica*) but always distinctly longer medially than next to eye. Forewing as in *friscana*.

Color pale testaceous-brown or cinereous with a few irregular brown or fuscous marks. Veins of distal two-thirds of corium of forewing marked with fuscous in some specimens. The small series at hand is rather uniform in color but considerable variation may be expected.

Sternite VII of female as long or longer than sternite VI, posterior margin broadly and shallowly emarginated. Basal margins of female pygofer covered by sternite VII. Male valve and plates as in *friscana*. Dorsal spine heavily sclerotized, distally with a pair of hook-like projections of about equal size, one directed caudad and one cephalad, in lateral view as illustrated (Fig. 7A). Style extending well beyond plate, the apex broad and subtruncate, the subtruncated margin slightly deflexed, outline of style and connective as illustrated (Fig. 7B). Aedeagus as illustrated in outline (Fig. 7C).

Holotype male, allotype female, and three female paratypes from Montara, Calif., June 13, 1935, P. W. Oman. Known only from the type material. Types in collection of U. S. National Museum, no. 55132.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ACADEMY

367TH MEETING OF THE BOARD OF MANAGERS

The 367th meeting of the Board of Managers was held in the Library of the Cosmos Club on Friday, March 14, 1941. President CLARK called the meeting to order at 8:08 P.M., with 21 persons present, as follows: A. H. CLARK, F. D. ROSSINI, H. S. RAPPLEYE, N. R. SMITH, W. W. DIEHL, J. H. KEMPTON, J. H. HIBBEN, J. E. GRAF, F. H. H. ROBERTS, JR., F. G. BRICKWEDDE, E. P. WALKER, R. M. HANN, W. A. DAYTON, H. L. CURTIS, W. RAMBERG, J. R. CHRISTIE, L. W. PARR, C. L. GARNER, and, by invitation, R. J. SEEGER, G. A. COOPER, and F. C. KRACEK.

The minutes of the 366th meeting were read and approved.

President CLARK announced the following appointments:

(*a*) Committee to Consider the Publication of a Directory of the Academy for 1941: A. H. CLARK (chairman), H. L. CURTIS, J. E. GRAF, H. S. RAPPLEYE, F. D. ROSSINI, and N. R. SMITH.

(*b*) Committee to Survey the Academy's Investments and Deposits: H. S. RAPPLEYE (chairman), A. T. MCPHERSON.

(*c*) Committee on Awards for Scientific Achievement for 1941: General chairman, J. M. COOPER; For the Biological Sciences, J. M. COOPER (chairman), F. O. COE, H. A. EDSON, E. A. GOLDMAN, I. T. HAIG, C. F. W. MUESEBECK, H. W. SCHOENING, G. STEINER, and A. WETMORE; for the Engineering Sciences, H. G. DORSEY (chairman), C. H. BIRDSEYE, F. M. DEFANDORF, J. H. DELLINGER, A. C. FIELDNER, P. A. SMITH, and P. C. WHITNEY; for the Physical Sciences, W. E. DEMING (chairman), W. G.

BROMBACHER, F. G. COTTRELL, L. V. JUDSON, S. KARRER, F. E. JOHNSTON, H. E. MCCOMB, P. G. NUTTING, E. W. POSNJAK, and F. O. RICE.

The Committee on Membership, F. C. KRACEK, chairman, presented nominations for membership for eight persons (seven resident and one nonresident).

The Board considered individually and duly elected to membership the five persons (all resident) whose nominations had been presented on February 7, 1941.

The Committee to Consider the Publication of a Directory of the Academy for 1941, A. H. CLARK, chairman, presented a report recommending the following: (*a*) that a Directory of the Academy and its Affiliated Societies for 1941 be published, at a cost to the Academy not to exceed $350; (*b*) that this Directory be produced by the photolithographic process; (*c*) that the present size of the Directory be retained; (*d*) that the color of the cover be red; and (*e*) that the contents be as follows:

I. The Academy
  1. History and present status
  2. Officers and committees for 1941*
  3. Past presidents
  4. Bylaws and standing rules
  5. Patrons
  6. Honorary members
  7. Nonresident members, listed alphabetically, with name, institution, and place
  8. Resident members
    a. Listed alphabetically, with name, institution, place, and societies
    b. Listed by institutions
  9. Deceased members

II. Philosophical Society of Washington
  1. History and present status
  2. Officers and committees for 1941†
  3. Members, listed alphabetically, with name and institution

III to XX. Remaining 18 affiliated societies, similarly arranged, except that no list of members is given for the Geographical Society and the Archaeological Society.

The Board approved this report and instructed the President to appoint a Committee, consisting of the Secretary and the Treasurer, to publish a Directory of the Academy for 1941 in accordance with the recommendations of the Committee, with the additional proviso that, if feasible, there be included for members of the Academy the year of their election.

The Secretary presented the following information with regard to changes in membership since the last meeting of the Board: Deaths, 1; acceptances to membership, 8; qualified for membership, 10 resident and 7 nonresident; retirements, 2; resignations, 2. The status of the membership, as of March 13, 1941, was as follows:

	Regular	*Retired*	*Honorary*	*Patrons*	*Total*
Resident	425	33	3	0	461
Nonresident	128	15	14	3	160
Total	553	48	17	3	621

* Provision will be made for inserting similar data for 1942 and 1943.

† If possible and desirable, provision will be made for inserting similar data for 1942 and 1943.

The Senior Editor, J. H. KEMPTON, asked the Board to approve the transfer of two of the three complete bound sets of the Journal in the hands of the Editors to the Custodian and Subscription Manager of Publications in order that the latter might have these available for sale to new institution-subscribers. The Board approved this request with thanks to the Editors.

The Custodian and Subscription Manager of Publications, W. W. DIEHL, reported the sale of one complete set of 30 volumes of the Journal.

President CLARK reported the resignation of G. STEINER from the Board of Managers because of the press of his work. To fill this vacancy for 1941, the Board elected F. C. KRACEK.

The Chairman of the Committee on Meetings, C. L. GARNER, reported on the plan of the Scientific Monthly to publish a monthly *Calendar of Scientific Meetings in Washington* and to make these available to the Academy and the various Societies at one-half cent per copy. The Board authorized the Secretary to send out copies of the calendar to all members with the next six mailings of notices of meetings of the Academy, the expenses to be paid from the regular budget of the Secretary.

The meeting adjourned at 9:40 P.M.

304TH MEETING OF THE ACADEMY

The 304th meeting of the Academy was held in the Assembly Hall of the Cosmos Club at 8:15 P.M. on Thursday, March 20, 1941, with President A. H. CLARK presiding. The meeting was devoted to the presentation by the Academy of its *Awards for Scientific Achievement for 1940*, as follows:

For the *Physical Sciences*, to FERDINAND G. BRICKWEDDE, Chief of the Cryogenic Laboratory of the National Bureau of Standards, for his distinguished service in assisting in the discovery of deuterium, in low-temperature researches on the different modifications of hydrogen, and in the development of a working scale of temperature in the range 14° to 83° K.

For the *Engineering Sciences*, to HARRY DIAMOND, Principal Physicist in the Radio Section of the National Bureau of Standards, for his distinguished service in developing radio methods for aircraft navigation, especially in "blind landing," and for upper-air meteorological soundings, including the radio sonde, and in the development of an automatic weather reporting station.

LYMAN J. BRIGGS, Director, and EUGENE C. CRITTENDEN, Assistant Director, of the National Bureau of Standards, introduced the recipients, who each gave a brief address concerning particular phases of the work for which the awards were made.

There were about 70 persons present. The meeting adjourned at 9:55 P.M. for a social hour.

NEW MEMBERS

The following persons have recently been elected to membership in the Academy:

Resident

RICHARD ELIOT BLACKWELDER, assistant curator, Division of Insects, U. S. National Museum, in recognition of his contributions to our knowledge of the West Indian Coleoptera.

FRANK P. CULLINAN, senior pomologist, U. S. Bureau of Plant Industry, in recognition of his researches in pomology, in particular with regard to apple and peach nutrition, pruning, stone fruit production, and carbohydrate-nitrogen relationships in peach shoots.

WALLACE JOHN ECKERT, head astronomer and director of the Nautical Almanac Office at the U. S. Naval Observatory, in recognition of his fundamental work in adapting the "punched-card" method to scientific computations, particularly in the field of astronomy.

AUREL OVERTON FOSTER, assistant zoologist, U. S. Bureau of Animal Industry, in recognition of his contributions to knowledge of hookworm disease, particularly with regard to anemia, prenatal infection, physiological strains, and host migration.

IRA BOWERS HANSEN, associate professor of zoology, George Washington University, in recognition of his reasearches on the anatomical effects of endocrines and of his services to science as a teacher of biology.

JOHN THOMAS LUCKER, associate zoologist, U. S. Bureau of Animal Industry, in recognition of his contributions to the ecology of larval and adult nematode parasites of domestic animals.

EDWARD GEORGE REINHARD, professor and head of the department of Biology, Catholic University of America, in recognition of his researches in embryology and hydrobiology, particularly with regard to the habits of solitary wasps, plankton, and experimental embryology.

LAWRENCE W. SAYLOR, assistant biologist, U. S. Fish and Wildlife Service, in recognition of his contributions to systematic coleopterology, and in particular his work on the scarab beetles of North, South, and Central America.

THEODOR VON BRAND, associate professor of biology, Catholic University of America, in recognition of his researches on the physiology of invertebrates, particularly with regard to their metaboism.

JAMES FRANKLIN YEAGER, senior entomologist, U. S. Bureau of Entomology and Plant Quarantine, in recognition of his researches on the general and comparative physiology of insects.

Nonresident

JOSEPH EVERETT ALICATA, parasitologist, Experiment Station, University of Hawaii, Honolulu, Hawaii, in recognition of his work in morphology, taxonomy, parasitic Protozoa and spirochaetes, immunity in metazoan parasites, and the life history of helminths.

ARTHUR CHALLEN BAKER, principal entomologist, U. S. Bureau of Entomology and Plant Quarantine, Colonia Anahuac, Mexico, in recognition of his work on fruit flies, tropical entomology, and the classification and biology of Aphidae.

WALTER E. DOVE, principal entomologist, U. S. Bureau of Entomology and Plant Quarantine, Panama City, Fla., in recognition of his work on overwintering of the house fly, bots of horses, creeping eruption, warbles of rein-

deer, goat lice, tropical rat mites, sand flies, dog and cat hookworms, and transmission of endemic typhus.

HOWARD SAMUEL FAWCETT, professor and head of the Department of Plant Pathology, Citrus Experiment Station, University of California, Riverside, Calif., in recognition of his work on citrus pathology, including his recent treatise on citrus diseases.

RUDOLF WILLIAM GLASER, associate member, Rockefeller Institute for Medical Research, Princeton, N. J., in recognition of his work in physiology, pathology, bacteriology, protozoology, and mycology of insects, and his work on virus diseases in plants, intracellular symbionts and reckettsiae, cultivation of Protozoa in the pure state, and nematode parasites on insects.

HAROLD FREDERICK LOOMIS, associate agronomist, U. S. Bureau of Plant Industry, Coconut Grove, Fla., in recognition of his contributions to the systematic classification of millipeds and to agronomic investigations on cotton grown under irrigation.

FRANK PADEN MCWHORTER, plant pathologist, Oregon State College, Corvallis, Oreg., in recognition of his work on the ecology of cryptogams, protozoan diseases of plants, parasitic phanerogams, vegetable pathology, diseases of ornamental plants and truck crops, diseases of tomatoes, tropical fruits, and virus diseases of plants.

RALPH ROBINSON PARKER, director of the Rocky Mountain Laboratory, U. S. Public Health Service, Hamilton, Mont., in recognition of his work on Rocky Mountain spotted fever and tularemia.

HOWARD SPRAGUE REED, professor of plant physiology, University of California, Berkeley, Calif., in recognition of his work in plant physiology, his book entitled *A manual of bacteriology*, and his work on the history of botany since 1801.

NORMAN RUDOLPH STOLL, associate member, Rockefeller Institute for Medical Research, Princeton, N. J., in recognition of his work on the biology of free-living stages of hookworm, severity of hookworm infection, hookworm in the American Tropics and China, self-cure and protection against nematodes by sheep, *Haemonchus*, *Monieza*, and culture of parasitic nematodes.

MARCELLUS HENRY STOW, professor and head of the Department of Geology, Washington and Lee University, Lexington, Va., in recognition of his researches in sedimentary petrography, and on the petrography and stratigraphy of the Oriskany formation and of the Bighorn Basin.

ORLAND EMILE WHITE, professor of agricultural biology and director of the Blandy Experimental Farm, University of Virginia, Charlottesville, Va., in recognition of his work in experimental biology, physical bases of inheritance, genetics of tobacco, peas, and castor-oil beans, and origin of cultivated plants.

FREDERICK D. ROSSINI, *Secretary*

Obituaries

DAYTON CLARENCE MILLER, professor emeritus of physics, Case School of Applied Science, died in Cleveland, Ohio, on February 22, 1941. He was born in Strongsville, Ohio, on March 13, 1866, and received the Ph.B. and M.A. degrees from Baldwin University in 1886 and 1889 and the D.Sc. degree from Princeton University in 1890. He was professor of natural science at Baldwin University in 1888–89. Following graduation from Princeton University he began his long career of distinguished service at the Case School of Applied Science, starting as instructor in mathematics and physics in 1890, becoming assistant professor of physics in 1893 and professor of physics in 1895, which position he held until his retirement recently as professor emeritus. He had been a trustee of the Baldwin-Wallace College since 1899 and since 1936 had served as chairman of the board of trustees.

Professor Miller published numerous scientific papers on investigations of the velocity of light in magnetic fields, the expansion of gases, Roentgen rays, the relative motion of the earth and ether, the efficiency of the incandescent gas light, applications of the interferometer, photographic registration of sound waves, and the quality of musical sounds. He was also the author of seven books, the first (1903) on *Laboratory physics* and the last (1939) on *Sparks, lightning, cosmic rays*. The other books dealt with acoustical and musical subjects.

Professor Miller is probably best known for his investigations of the relative motion of the earth and ether and for his fine collection of flutes. This collection, which illustrates the development of the flute from very early times, contains nearly 1,000 musical instruments and is believed to be the world's largest. The collection began as an avocation but became the inspiration of some important contributions to the acoustical science of music and to the development of an improved flute. It has been bequeathed to the Library of Congress and thus becomes a valuable heritage of all the people. A gold flute, made in accordance with Professor Miller's directions, has been used by symphony orchestras with brilliant effect in certain passages.

His work in the field of acoustics was widely recognized. He studied acoustics in relation to auditorium design and drew the specifications for some of the large auditoriums throughout the United States. Among these auditoriums are Severance Music Hall, the Epworth-Euclid Methodist Church, and the First Church of Christ, Scientist, in Cleveland, and the chapels at Denison University, Bryn Mawr College, Princeton University, the University of Chicago, and also the acoustics of the National Academy of Sciences Building in Washington, D. C. In addition to these, Dr. Miller designed specifications for about a hundred other churches, theaters, hospitals, offices, and large and small auditoriums.

Professor Miller was honored with the Longstreth Medal of the Franklin Institute, the Elliott Cresson Medal, and the Cleveland Distinguished Service Medal. He held honorary degrees from Miami University in Ohio, Dartmouth College, Western Reserve University, Baldwin-Wallace College, and Case School of Applied Science and was a member of a number of scientific societies in some of which he held important offices. He was a nonresident vice-president of the Washington Academy of Sciences in 1922 and president of the American Physical Society in 1925 and the Acoustical Society of America in 1931–32. Professor Miller's long continuous period of service in the American Physical Society began in 1914 when he was elected to the

Council of the Society and extended without interruption to his death when he was serving on the Council as a past president. It was a matter of great satisfaction to Professor Miller and to his many friends that in that long period he had been able to attend, with only a very few exceptions, every meeting of the Council and the Society.

Professor Miller will be long remembered by his many friends and acquaintances for his scholarly attainments and for his gentle and courteous manners.

WILLIAM WILLIAMS GILBERT, senior pathologist, Division of Fruit and Vegetable Crops and Diseases, U. S. Bureau of Plant Industry, died at Washington, D. C., on December 22, 1940. He had been in ill health for some months, but with surprising courage carried on his official duties almost to the hour of his death, the immediate cause of which was a cerebral hemorrhage.

Mr. Gilbert was born in Dorset, Vt., on September 17, 1880, and was graduated from the University of Vermont in 1904 with the B.S.A. degree and Phi Beta Kappa honors. In 1909 he was awarded an M.S. degree in plant pathology by the University. He did postgraduate work at the University of Wisconsin, George Washington University, and in the Graduate School of the Department of Agriculture.

In 1904 he was appointed a scientific assistant in the office of cotton and truck crop diseases, Bureau of Plant Industry, assisting the late Dr. W. A. Orton in breeding disease-resistant varieties of cotton, watermelons, and cowpeas. During the early years of his Department service—and he spent his entire scientific life in the Department of Agriculture—he worked mainly in the Southern States and was charged with much of the responsibility for the investigations of the office there. Later, as Dr. Orton's health became impaired, Mr. Gilbert spent most of his time in Washington, assuming general administrative charge of the office. When the office was consolidated with the new Division of Fruit and Vegetable Crops and Diseases, Mr. Gilbert was drafted to fill the position of subject-matter specialist in charge of publications, his technical background fitting him admirably for this work. This position he held until his death, his spirit of helpfulness and his infinite supply of tact proving invaluable.

He was a member of the Botanical Society of Washington, the Washington Academy of Sciences, the Botanical Society of America, the Vermont Botanical Society, and a charter member of the American Phytopathological Society, as well as a Fellow of the American Association for the Advancement of Science. He was the author of more than a score of bulletins and scientific papers dealing with plant pathological problems.

Mr. Gilbert's entire life was marked by an outstanding spirit of service and a persistent adherence to the highest ideals in his official work, his church activities, and in the various community projects to which he lent his aid. He was a member of the Board of Trustees of the First Congregational Church of Washington, D. C., and served as secretary of the Board. For many years he was also a trustee of the Congregational Home for the Aged.

His wife, the former Ottonie Ulickson, died in 1937. He is survived by a son, Henry Philip Gilbert, of Washington, D. C.